

PALLEN (M.A.)

REPORT

ON THE

VARIOUS SURGICAL OPERATIONS

FOR THE

RELIEF OF DEFECTIVE VISION.

BY

MONTROSE A. PALLEN, M.D.,

OF ST. LOUIS, MO.



EXTRACTED FROM THE

TRANSACTIONS OF THE AMERICAN MEDICAL ASSOCIATION.

PHILADELPHIA:

COLLINS, PRINTER, 705 JAYNE STREET.

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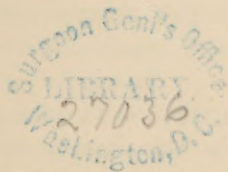
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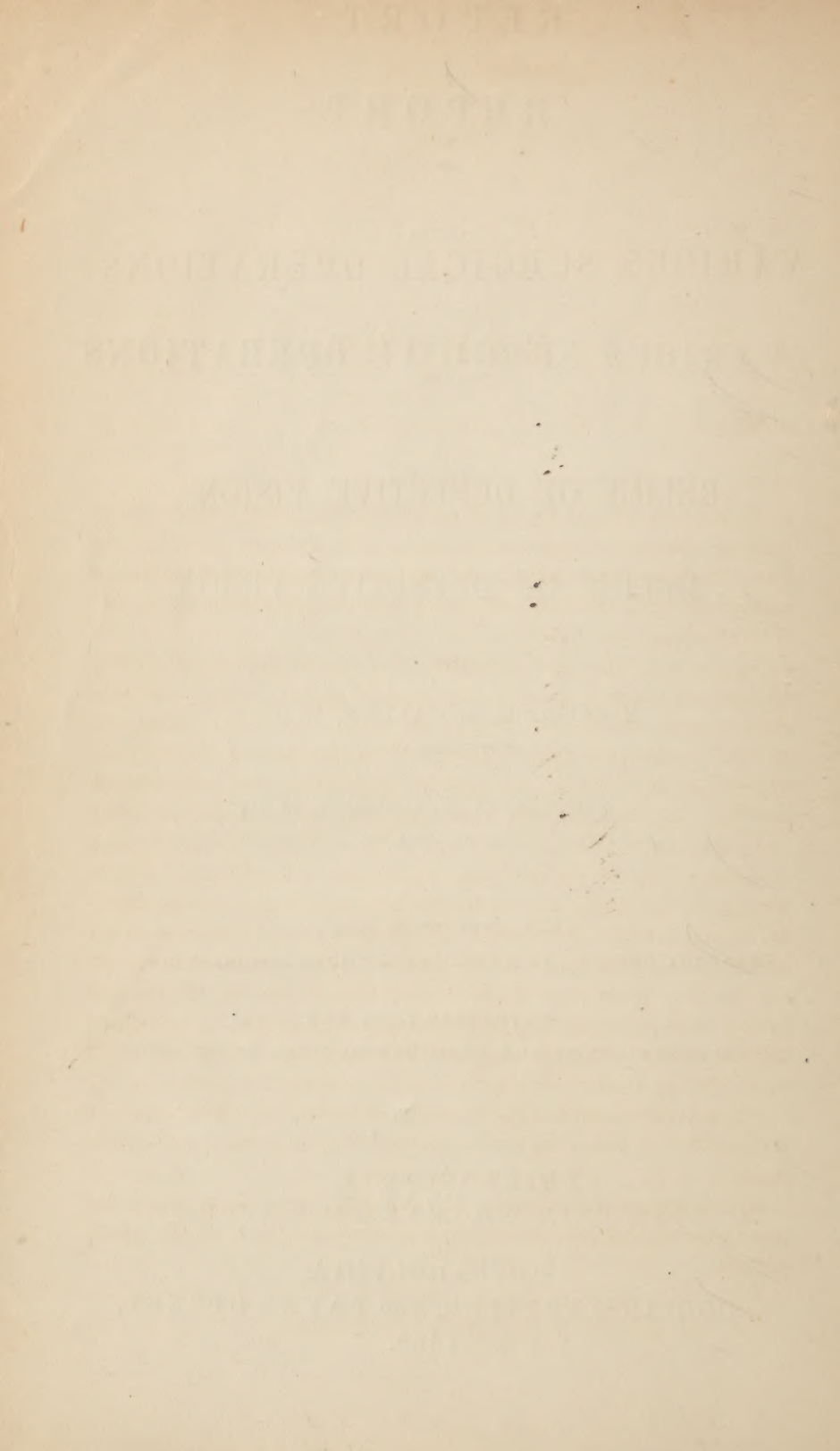
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## REPORT.

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WERE I to attempt to report upon *all* the defects of vision requiring surgical interference, I might write volumes and then not have finished, in a complete and altogether satisfactory manner, a subject fraught with interest, not only to the ophthalmologist, but to all medical philosophers.

I propose in this report to consider such subjects as are strictly ocular, and which, from their physiological and anatomical relations, cannot come under the domain of general surgery. Thus, the various tumors, whether malignant or non-malignant, either of the osseous or soft tissues, will not be considered; nor will dropsy, abscess, ulceration, or injury be specially noticed, although many individual cases of such have required and will continue to require surgical means to induce a cure of abnormal conditions. Under the head of injuries, are wounds, contusions, burns, scalds, chemical agents, foreign bodies, etc. The last mentioned embraces every conceivable object, and among them—a by no means unfrequent occurrence—is the deposition of the larvæ of insects. Many, and in fact most, of the defects of vision requiring surgical interference are the effects of the above-mentioned category, and, as such, will be treated of rather in a generic than in a specific manner.

All the affections of the apparatus of vision are either *extra-* or *intra-ocular*, or of a *composite* character, being both intra- and extra-ocular.

In this report, for the sake of simplicity, the defects of the appendages will be first considered, after which those of the globe proper.

## PART I.

DEFECTS OF THE APPENDAGES.—The defects of the appendages—viz., the eyelids and the muscles of the ball—will be considered, each in a separate chapter.

DEFECTS OF THE EYELIDS.—The defects of the eyelids are, *Anchyloblepharon*, *Symblepharon*, *Trichiasis*, *Entropium*, and *Ectropium*.

## CHAPTER I.

## ANCHYLOBLEPHARON.

Anchyloblepharon is complete or incomplete, as the free borders of the lids are united in the whole extent or not, and is *mediate* (pseudo-membranous) or *immediate* (conjunctival). It is *incomplete* usually when the outer angle of the lids is destroyed, and *complete* union generally leaves the borders at the inner canthus free.

It is *congenital* or *acquired*, and, when the former, is generally complete; and with the latter is most frequently associated symblepharon.

Anchyloblepharon (ἀγκύλος, crooked, βλεφαρον, eyelid) is a union of the eyelids to each other at their tarsal borders. This affection was noticed even as early as in the times of Heraclidus, who advised specific treatment for it.

*Causes*.—It may be congenital (rarely) or acquired.

*Characteristics*.—It may be complete (*perfectum*) or incomplete (*imperfectum*), and the union may take place at any portion of the lid, or in its whole extent; as to the nature of that union, it may be mediate or immediate, as above stated.

*Prognosis*.—The prognosis depends upon the degree and character of the affection, and relief is to be obtained only by means of an operation, the nature of which is more or less modified by the lesion in question, and upon which we are to base the prognosis.

*Operation*.—The operation for the relief of anchyloblepharon consists in dividing the united lids—either by the bistoury, the suture, or the probe, or by a union of the whole of them—and to prevent their reunion. The ordinary procedure is to introduce a bent cannelated sound, through whatever opening that may exist, its convexity towards the lids; a narrow straight bistoury is then introduced, and the incision made in the palpebral commissure.



Maître Jan recommended the (*ciseaux-boutonnés*) button scissors instead of the bistoury. If, however, no opening exists (*anchyloblepharon perfectum*), one should be made by raising the lids and exercising traction up and down upon the upper and lower lids, and proceed as in the case of incomplete union.

Carron du Villard proposed cauterization of the lids sufficiently often to form an eschar which would prevent a union of the divided edges.

Malgaigne advises Duddell's method, which is that of Fabricius de Hilden, and consists in dividing the adhesions by means of a knotted ligature. Desmarres condemns it as an unwarrantable procedure.

Whatsoever may be the method of operation, the permanent retention of the lids disunited, is the object sought to be obtained. Besides the others above mentioned, Steber recommends that the lids be held apart at least twenty-four hours after the operation. Celsus advised the intervention of foreign bodies between the lids, which has been tried, with varied success, by Rosas, Bartisch, and Solingen. Schindler threw two ligatures around the adhesions, and tightened them in contrary directions.

In fact, any one of the above methods may be tried, but will not succeed unless the procedure of Amussat be conjoined, which consists in rupturing the adhesions which form (*ex necessitate rei*), either by the sharpened finger-nail (*Lisfranc*), or by a pen point, or a small bistoury.

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## CHAPTER II.

### SYMBLEPHARON.

Symblepharon, or an adhesion of the lids to the globe, is complete or incomplete, complicated or uncomplicated, mediate or immediate. It is complete when the whole of one (or both) lid is glued to the globe; incomplete, when one or more filiform or ribbon-like shreds intervene; complicated, when any other lesion co-exists, more particularly anchyloblepharon; uncomplicated, when none such exists. It is mediate when a false membrane or cicatricial tissue causes the union; immediate, when the conjunctiva of the lids is directly united to that of the globe.

*Object of an Operation.*—The object of an operation is the re-establishment of the motions of the globe (and sometimes to cure the blindness owing to its being bound down by the adhesive bands, and consequently the impossibility of motion of the globe) by a destruction of the adhesions and the prevention of their reformation. Various methods and procedures have been devised, meeting with more or less success according to the extent of the lesion. Complete symblepharon is incurable, as it is impossible to prevent a reproduction of the adhesions; therefore, we should only attempt an operation when incomplete.

Fabricius de Hilden<sup>1</sup> was the first who reduced the principle to a method, in his patient who had been wounded in the eyelid by a sword thrust, and suffered, as a consequence, a partial symblepharon (incomplete). Fabricius passed a probe behind it, embraced it in a ligature, to which he attached a piece of lead, which cut its way through about the ninth day. No reproduction of the adhesion followed.

Pétréquin<sup>2</sup> proposed, and succeeded in several instances in effecting a cure by passing two threads—one close to the sclerotica, the other near the eyelid—and first tying the former very tightly and the latter loosely. After the sclerotic portion had cut its way out, and the surface had cicatrized, the remaining thread was tied, which, after cutting its way out, left but one surface to heal, which being done the cure was complete.

Bartisch, after having dissected off the mucous bridles, interposed a leaden plate; Rosas, an artificial eye formed of wax; Démours, the same smeared with the oil of sweet almonds; Carron du Villard, an ivory shell softened by hydrochloric acid (fitted to the eye). Callisen introduced a bit of bladder or intestine; and Solingen a piece of parchment. Mr. Hunt, of Manchester (England), makes a puncture through the adhesion, and daily passes a probe through the wound until suppuration ceases, and the edges become callous; when the section of the adhesion may be finished by the bistoury. The procedure of Amussat, favorably mentioned by Desmarres,<sup>3</sup> and as strongly condemned by Sichel,<sup>4</sup> consists in first dividing the mucous bridles, and daily, thereafter, rupturing whatever union may have taken place, by the point of a pin or the edge of some

<sup>1</sup> Guilhelm Fabricii Hilden, opera omnia, p. 502. Francofurti ad Moenum, 1646.

<sup>2</sup> Supplément des Annales d'Oculist, t. iii. p. 56.

<sup>3</sup> Desmarres, Maladies des yeux, t. i. p. 464. Paris, 1854.

<sup>4</sup> Sichel, Iconographie ophthalmologique, section xxvi. 717-18 et seq.



cutting instrument. Desmarres adds that he frequently saw Lisfranc during a period of fourteen years, perform it upon the prepuce of such as had been operated upon for phymosis, with the point of his finger nail, and he naively adds that the practice sometimes produced an erysipelas. This procedure of Amussat requires a watchfulness and perseverance upon the part of the physician which as a general rule is not commensurate with the result. Desmarres, however, details some cases in his lectures, wherein he obtained a favorable result from the above procedure. Ammon<sup>1</sup> proposes (and in several instances successfully treated symblepharon) a *blepharoptemy*, which consists in not touching the morbid adhesions; but in making a triangular incision, the base of which is at the tarsal edge of the lid, cutting through its whole thickness, and whose apex meets at an acute angle, at a point corresponding to a free portion of the lid forming a triangular flap, including the whole of the lesion. He then brings over this triangular flap, the remaining portions of the lid, which are united by several points of twisted suture. This leaves the subjacent flap untouched, which is still adherent to the eye, and when the wound is united and no raw surface left to which another might unite, it is dissected off. Ammon advises after each operation that "compresses wrung out of iced water be applied to moderate the inflammation." Dieffenbach<sup>2</sup> proposed for this operation one of his most ingenious procedures; this consisted in folding the lid upon itself, so that its cutaneous surface was applied to the conjunctiva of the globe. The steps of the operation are as follows, taking the lower lid for example; the cilia are first shaved off, then two incisions at right angles to the lid, one running down the nasal, the other at the outer edge of the orbit, producing a quadrilateral flap, when the symblepharon is dissected up, the lid folded upon itself (thus making a complete entropium), and secured by four sutures. The parts are then well supported by adhesive (or isinglass) plaster. After the wound of the globe has well cicatrized, the points of suture are removed from the flap and it is replaced in its normal position. Blandin has proposed a procedure, and operated with signal success; he had a patient, whose right lower lid was adherent to the globe in consequence of a burn caused by the presence of some melted metal. The ulceration which followed was in a mea-

<sup>1</sup> Ammon, *Zeitschrift für die ophthalmologie*, vol. iii. p. 250. Dresden, 1833.

<sup>2</sup> Dieffenbach, *Chirur. Operat.*, vol. i. p. 482. Leipsig, 1845.

sure neglected, and as a result there was formed an external adhesion implicating the lower half of the cornea, elliptical in shape, bluish-white in color, very dense, which produced a feeling of constraint in the motions of the ball, very fatiguing to the patient. He dissected the cicatrix from above downwards (thus removing the adhesion which united the lid and globe), turning it inwards like a hem, forming a substitute for the palpebral conjunctiva; this being done, he secured it by the glover's suture, and carried the two extremities of the thread horizontally outwards and attached them to the two temples, so as to keep the edge of the lid free from the cornea, which prevented any new adhesions forming. The sutures were removed on the fourth day, and three weeks afterwards the eyeball had recovered its normal mobility, and the lids well approximated to each other.

*Appreciation of the Operations.*—It is very difficult to give a preference to any of the above procedures. Amussat, however, is the only one by which I have seen the operation succeed, and from the happy result which it produced, it merits at least the trials which the European ophthalmic surgeons have so persistently given it.

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### CHAPTER III.

#### TRICHIASIS.

This affection would hardly seem to warrant much attention; except that its effects are most baneful, as it very frequently engenders defective vision, and even blindness. A notice of the various remedies for it are particularly interesting to all ophthalmologists. Trichiasis is a condition of misdirected cilia, generally inverted. Some authors make another division, of distichiasis, or a double row of misdirected cilia, which, according to Walton and Desmarres, is but an apparent condition of duplicature, owing to the exuded matter within and around the hair bulbs; in which opinion I fully concur, for although there may be a double implantation, the real number of cilia is not increased. Winslow and Albinus both mention the irregularity of the position of the hair bulbs, and as the treatment is the same, it is a matter of minor importance whether the lesion exists or not.



*Characteristics.*—It is either *pathological* or *mechanical*. It is pathological, when it is caused by a glandular blepharitis, ulceration of tarsal margin of lids, existence of fistulous openings to the Meibomian glands, and a diseased condition of such and their bulbs.

It is mechanical, when caused by an entropium, a swelling of the conjunctiva, the presence of one or several tumors, chemical substances, or any traumatism whatever.

*Degrees.*—It may be *partial*, embracing but one or few cilia, or *complete*, comprising a total inversion of all the cilia, save those at the corners of the lids, which are never (except in entropium) changed so as to interfere with the healthy action of the lids and globe proper.

*Treatment.*—The methods devised are as various as they are ingenious: the more generally used ones consist in—

- a. Evulsion of the cilia.
- b. Evulsion with cauterization.
- c. Reduction of the cilia.
- d. Cauterization.
- e. Exsection of a fold of musculo-cutaneous substance (method of Desmarres and Walton).
- f. Exsecting a portion of the whole palpebral thickness.
- g. Amputation of the tarsal cartilages.
- h. Dissection of the bulbs.

*Evulsion.*—Evulsion of the cilia was performed, according to Galen, by the Greek physician Popius, and has repeatedly been advised in various ages past, to the present era, by Celsus, De la Vanguyon, Avicenna, Averahoes, Maître Jân, de la Motte, Richter, Callisen, Beer, Rowley, Sanson, Quadri, and many others. The methods have been various; but that which is now employed is known as the procedure of Beer, which consists in using the forceps invented by him for that purpose, seizing the lashes and plucking them out. Care should be taken not to break them off, and in order to do that, traction should be made in the axis of the orifice. A lens greatly facilitates the operation. This method is but palliative, and the advantages gained but temporary, owing to the reproduction of the cilia: hence, the operation must be frequently performed. Taignot, in his work on diseases of the eye, states that oft-repeated evulsion causes the hairs to become finer and slimmer after each operation.

*Cauterization.*—Conjoined to evulsion, many of the older and



some of the modern surgeons advise cauterization of the bulbs in order to insure their destruction; either by the agency of the actual cautery, some chemical substance, more particularly the butter of antimony, caustic potassa, and nitric acid, or by means of electricity. Rhazes, Paulus Æginetus, Celsus, Ambroise Paré, Dionis, Boerhaave, Saint-Yves, Richter, and Pellier, make special mention of it. Champêsmé in modern times revived the method, and he received the thanks of the Academy of Medicine for his method, as Lisfranc and Dénouars, as a committee, reported very strongly in its favor. It consists in heating to a white heat a curling-tongs, by which a needle is seized and passed into the bulb, and an eschar ensues. The needle heated of itself would not retain sufficient heat, but conducts it from the curling-tongs and induces the desired object.

Champêsmé states to have radically cured many cases of trichiasis by means of this method. Solera, an Italian surgeon, practised cauterization of the bulbs by means of very small pencils of caustic potassa, moulded for that purpose. Care must be taken not to cauterize any other portion save the one in question. Richter, Saint-Yves, Callisen, and Carron de Villards, have recommended the cauterization practice. Solera's method is only applicable in such cases as those in which Desmarres excises a small fold of cutaneo-muscular substance, of which more anon.

*Reduction.*—Reduction of the cilia consists in maintaining them turned outwards upon the lids, by means of an apparatus specially adapted, which may be agglutinative substances, ligatures, etc. Heraclidus maintained the reversed lids by means of plasters; Velpeau states to have succeeded in this manner when excision of the integument had failed. Galen and Celsus mention a method consisting of passing through the lid a needle armed with doubled suture, composed of a long hair (woman's,) the noose of which confined the erratic cilia. Rhazes succeeded in reducing the trichiasis by means of a small curling-tongs. In more modern times, Dr. Jacob, of Dublin, has been quite successful in cementing the disturbed cilia to the other, or to the skin, by means of collodion or gum-shellac, and maintaining them in that position for several weeks. Mackenzie makes most favorable mention of the method. Sanson and Riberi attached the deviated hairs to the cheek by means of a thread, or tied them to the adjoining ones, and so kept them until a rectification had taken place.

*Cauterization* alone is practised in the manner above described when speaking of it in conjunction with evulsion. Carron de

Villards has added another method, which consists in passing an entomologist's needle into each bulb, following the direction of the cilium, and seizing it (or them as the case may be) with a *white-heated* curling-tongs: immediately the needle becomes heated and destroys the bulb and its contents. An analogous condition to this is the destruction of the bulbs by means of inflammation, and to Dr. James Hunter, of Edinburgh, the credit of the method is due. The parts being stretched over a horn spatula, the bulb is punctured with a lancet or iris knife to the depth of one-eighth of an inch, when a drilled darning-needle, previously dampened and dipped in the tartrate of antimony, is inserted in the puncture (the lash having been extracted), and held there some few seconds. The inflammation which ensues generally lasts about twenty-four hours, and the desired object is attained. A slight pustulation sometimes ensues in the course of a few days.

*Excision of a Fold of Musculo-cutaneous Substance.*—Desmarres recommends in partial trichiasis, that a small portion of the skin immediately opposite the inversion be taken up by means of a hook or forceps, and shaved off, generally with the cataract knife of Beer. The wound is left to itself, and the contraction ensuing upon cicatrization rectifies the deformity. Dr. Littell, of Philadelphia, says, that "a simple plan, and one equally effectual, is to raise the fold of skin by the entropium forceps, and excise it with the curved scissors; the edges of the wound being approximated by a single suture, or left to heal as proposed by Desmarres, according to the extent of the part removed." Haynes Walton's method is but an extension of Desmarres' plan, and is applicable to a few misdirected lashes, or to a complete trichiasis, and consists in the dissection of a flap of cutaneo-muscular substance in an extent corresponding to the misdirected cilia; the parts are then brought together by means of sutures. The mechanical, as well as the cicatricial effects are to evert the tarsal cartilage in such a manner as to induce in very many instances a permanent remedy for the defect. It would be useless to enter into a detailed account of the operation, as it is so graphically described in Walton's excellent treatise on operative ophthalmic surgery, that it would be presumption on my part to attempt a better or even so good a description. Jäger's operation as well as Rosas' consists, in addition to Walton's, in the extirpation of the bulbs, taking care to leave the Meibomian apertures, lachrymal canals, and puncta intact. If too much skin be taken, there is a tendency to ectropium. Bordenave, Louis,

Scarpa, Beer, Langenbeck, Bartisch, and Adrianson, treat very favorably of excision. The method of the last named is one of the curiosities of obsolete surgery, but space forbids its quotation. Avenzoar also speaks of the loss of substance occasioned by sloughing from pressure, in the treatment of trichiasis.

Exsection of a portion of the whole of the palpebral thickness was advised for partial trichiasis by Schreger and Sir W. Adams, the incision being inverted  $\Lambda$  shaped, and so made that the imaginary base of the triangle embraces the deviated cilia, after which the edges of the wound are united by means of sutures. Monteath as well as the above mentioned authors, used a bistoury to make the incisions, whereas Richerand used a curved scissors. Chelius employed the method with great success, and still recommends it, as in 1857 we witnessed him operate in this manner in the *Krankenhaus* of Heidelberg. S. Cooper, Heister, and Delhaye Gendron, also advise the operation when indicated.

*Amputation of the Tarsal Cartilages.*—Amputation of the tarsal cartilages has been said by Delpech to be truly a mutilation, and we are in a measure compelled to agree with him, although great authorities sanction and advise the operation. Heister advised it. Saunders said and wrote so much about it, that it frequently is known as his operation; and latterly Bécлар, Tyrrel, Gerdy, and others, laud the procedure. Gerdy even wrote a monograph on the subject, in which he attempted to show that the deformity diminished in time. Notwithstanding Bartisch and his contemporaries practised it, that Dupuytren and Roux did it, and that Desmarres, Bowman, and Mackenzie now practise it, I believe, with Delpech and Nélaton, that it is an *opprobrium chirurgicæ*. I know no better term for it than that it is a *lazy* operation. The operation consists in cutting with a bistoury upon an ivory spatula, or snipping off, by means of scissors, the tarsal edge of the palpebræ, avoiding, of course, the lachrymal punctum, although Desmarres seems to think that useless, as it would prevent undue lachrymation; wherefore we cannot see, unless glandular action depends upon the presence of cilia, and the ablation of which causes its cessation.

*Dissection of the Bulbs.*—Dissection of the bulbs, or the method of Vacca Berlinghieri, was first performed in cases of partial trichiasis, and applied to cases either partial or complete by Flarer, of Pavia. According to Nélaton, Sanson is the only surgeon in France who has made any decidedly marked cures, and it is



from this fact that we were led to call amputation of the tarsal cartilages a "lazy operation," as it can be rapidly done, and without much trouble to the operator; whereas in Vacca's operation much nicety is required and difficulty encountered. This operation I have several times performed with marked success in three cases, and much benefit in one. My modification consists in the plan laid down by most authors, with one exception. An incision a quarter of a line from the tarsal edge is made, embracing in extent either a part or the whole edge (in relation to the number of deviated cilia); two vertical ones are then made at each extremity; the flap is then dissected up. An assistant of course supports the head, &c. The exception above mentioned consists in employing the ring-forceps of Desmarres, instead of the spatula of Beer, which in a measure controls pain, and completely checks all hemorrhage—a difficulty sometimes of an insuperable character.

*Résumé and Appreciation.*—From the experience I have had, and the weight of calm consideration, I am inclined to adopt the operation of Walton in cases of partial trichiasis, and that of Vacca Berlinghieri in such as are complete, including, of course, pathological trichiasis. When it is mechanical, depending upon a blepharoptosis, a tumor, an entropium, or a traumatism, analytical treatment is applicable, viz., getting rid of the cause, which is special, and requires specially adapted procedures, which cannot be considered in this report.

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## CHAPTER IV.

### ENTROPION.

Entropion (έν, in, *ερείπω*, I turn) is the rolling inwardly (upon itself) of the tarsal edge of the lid. There are various degrees of it, from a simple partial deviation to a complete concealment of the border of the lid. Contrary to the high authority of Haynes Walton, I believe there are five varieties (Walton believing only in one, viz., the muscular entropium), which are, I. Tegumental; II. Conjunctival; III. Mechanical; IV. Tarsal; and V. Muscular. Such a classification is very rational, and evidently embraces the whole *casus pathologica* of entropium, based upon anatomical principles, enunciated as applicable to all lesions by the great Bichat.

Whatever may be the variety, the treatment is its rectification primarily by getting rid of its cause. As to the etiology, etc. of the lesion, it is in this report entirely out of place. There have been numerous methods devised by ingenious surgeons as applicable to each and every form, variety, and grade of the disease.

I. *Tegumental Entropium*.—For the simple forms of the lesion, the application of adhesive straps, composed either of diachylon plaster, bandages soaked in collodion, glue, gum-tragacanth, etc., applied to the tarsal edge of the lid, and attached to the forehead or cheek, as either the upper or lower lid is affected. Fabricius d'Aquapendente, Scultetus, Lawrence, Janin, Stœber, Sanson, Velpeau (after excision had failed him), Travers, and Mackenzie have succeeded in this manner. Démours relates to have cured a patient in twenty days by this method, in whom entropion had existed for four years, and that for ten years afterwards, whilst he had knowledge of his (the patient) whereabouts, the eyelids remained in their normal condition. This procedure is not reliable, as Desmarres relates to have seen it produce erysipelas: Démours also relates another method in which the patient is seated in front of a mirror and holds the lid open with his fingers; at night, if sleep overpower him, the sitting posture should be maintained, the mirror always in position, so that in waking the condition might be immediately noticed, and the treatment resumed. Among many other examples, observes Démours, "I find in my journal that of a lady seventy years of age, who had suffered for fourteen years with entropium, who was cured in two days and one night by such means. During this period she only slept once for a short period of two hours." This method of *forced reduction* has been sought to be attained by other means, which consist in passing silken (or metallic) threads through the lids, and affixing them as above mentioned; which is uselessly painful if not cruel. Wardrop, Kœhler, and others have advised such, and mention cures as supervening from the method. Lawrence and Middlemore attempted, if they did not succeed, in several instances to induce a cure by means of a spring attached to the rim of spectacles, which pressed upon the lid so as to hold it up or down accordingly as the upper or lower one was affected. Desmarres has also modified this method of *forced reduction* in slight cases, by passing a suture pin through a vertical fold of skin near the cilia, embracing the pin and fold of skin tightly with a thread, and if it be the lower lid, attaching it to the opposite ear by passing it under the chin; if it be the upper

lid, to pass it over the forehead to the ear. In mild cases Carron de Villards vesicated the lids, and kept the blister in an open condition by means of excitants, for a certain period, and when cicatrization took place, a sufficient amount of contraction followed to insure a rectification of the deformity. He reports six cures. The denudation of the skin was performed by means of the tincture of cantharides, and Dieffenbach speaks very highly of it: at present the more elegant cantharidal collodion preparation might be used.

*Cauterization proper.*—Cauterization proper was much used by the ancient Greek, Roman, and Arabian physicians, and mention is made of it by Hippocrates, Celsus, and Albucasis, Ambrose Paré, Delpech, Larrey, and latterly Jobert recounts cures and advises the method. If the actual cautery be used, great caution should be exercised, and the spatula of Beer placed under the lid to prevent injury to the globe; the iron should be passed over very lightly. When the eschar falls the part should be dressed with greased lint. Unless a complete rectification takes place the operation should be repeated. It always leaves a greater cicatrix than excision. The eschar may be too small, when the operation must be repeated, or it may be too large, and cicatrization ensuing, causes entropion.

*Potential Cauterization.*—With regard to potential cauterization by sulphuric acid, the attention of the profession was called to it in 1815 by Helling, and cases with it related in 1818 by Quadri. The manner of applying it consists in placing a piece of amianthus or a glass rod in the acid, and then touching the lid; generally the spot is marked with ink. Sometimes the lid is seized with a forceps, the ends of which are covered with cotton, so as not to hurt them; chloride of zinc, butter of antimony, caustic potassa, etc., have been advised by various authors, and successes with them recounted.

*Excision of the Skin.*—Excision of the skin was first advised by Celsus, and since by Ætius, Paulus Æginetus, Acrel, Saint-Yves, Dionis, Janin, Scarpa, Wenzel, Gendron, Bordenave, Louis, Verduin, Stievenart, Velpeau, Cunier, A. Bérard, Tavignot, and Desmarres, with various modifications proposed by some of them and adopted by the others, and may be reduced to three procedures.

1. Excising a cutaneous flap and permitting it to granulate, as advised by Gendron, Scarpa, and Wenzel.

2. The method of Celsus, or the excision of a flap and uniting the edges by means of sutures and adhesive straps.

3. The method of Dionis, or the passage of the sutures or pins,



prior to the excision the flap is seized by a forceps and held up, when the sutures or pins are made to traverse the base. The twisted suture is used when the pins are passed (Verduin invented a forceps with small holes in the point plates, through which the sutures or pins could pass; this instrument is at present not at all used). This method has been adopted by Stievenart de Mons, Velpeau, Tyrrel, Cunier, A. Bérard, Tavignot, and Desmarres. Janson (of Lyons) modified the method of Dionis, or rather changed the incision from a transverse to a vertical one, as the former was frequently insufficient, and if successful, sometimes produced almost a deformity by increasing the vertical diameter of the eye, which the vertical section completely obviates. In order to operate according to the procedure of Janson, a fold of skin is taken up by the forceps of Adams, and excised with the curved scissors. Janson advised a simple suture in the dressing of the wound; but Lisfranc more properly advised the twisted suture, and his advice has generally been followed by all surgeons. In very severe cases, and particularly in old people whose skin is flabby, several vertical sections are made, whilst conjointly cicatrizing, throw out the tarsal border from the conjunctival surface. Carron de Villards highly praises this method. A crucial incision may be made, according to the method of Ségond, which leaves a lozenge-shaped wound, and is but the revival of Bouchacourt's modification of Acrel's procedure. Gaillard, Dzondi, Janin, and Sanson have proposed some few modifications of these methods, but which are adapted to special cases.

There are some observations applicable to all of the methods of excision, which are, that the amount of skin excised should be in proportion to the inversion of the lid, which can be readily measured by seizing with a forceps (such as those of Beer, Adams, Graefe, or Boyer) such an amount as rectifies the entropium, or probably a little less, as the contraction following cicatrization always increases the turning out of the lid. If the entropium be complete, the incision, if transverse, must extend from one commissure to the other; or, if the method of Janson be applied, several vertical incisions must be made.

II. *Conjunctival Entropium*.—Conjunctival entropium is in a measure also a mechanical one, and the generalization of getting rid of the cause rectifies the effect in all lesions, is equally applicable in this case. Abnormities of the conjunctival mucous membrane, when producing entropium, do it in a mechanical way, and

it is most frequently associated with symblepharon; and the remarks concerning the treatment of this affection are also here applicable. When, however, the palpebral conjunctiva is covered with cicatrices, such, for instance, as arise from burns, &c., the condition is almost a hopeless one; but if the cicatrices arise from another cause, and are few, small, and not very dense, a rectification of the entropium may at least be attempted by their excision, and any such additional treatment as is advised in the remarks made upon tegumental entropium.

III. *Mechanical Entropium*.—The mechanical entropium generally arises from burns, the presence of a tumor, an abscess, &c., and as each case presents particular features applicable to it alone, the consideration of this part of the subject, *ex necessitate rei*, cannot be incorporated in a general report.

IV. *Tarsal Entropium*.—Entropium arising from an abnormal disposition of the tarsal cartilages, requires special procedures when it cannot be cured by those previously considered. The principal ones of this nature are those of Crampton as modified by Guthrie, and Saunders.

1. Crampton's method, as modified by Guthrie, and as practised with success by Rosas, Jaeger, Sr., and Sir W. Adams, consists in the following: The patient is seated, as in the operation for cataract, before a window, an assistant standing behind supports the head upon his chest, whilst the operator seizes the lid with a forceps (either of Beer or of Adams) by its tarsal margin; two vertical incisions are then made through its entire thickness by means of stout, straight scissors, for about half or three-quarters of an inch in length, so as to embrace the fibres of the orbicularis muscle, one at the outer angle, half a line from the commissure, the other half a line from the *punctum* at the inner angle. If the tarsal cartilage, after these incisions, retain any abnormal curvature, then the muscle has been ineffectually divided; which, having been done, and it still is perverted, Guthrie made a transverse incision in the conjunctiva, and excised a transverse portion of the integument (after the manner of Celsus above described). The transverse, cutaneous wound is then brought together by means of sutures, and the vertical ones left to themselves; cold water dressings or greased lint is all that is applied.

2. The method of Saunders consists in an amputation of the tarsal cartilage, and the procedure is the same as that mentioned in the article on trichiasis.

V. *Muscular Entropium*.—Of all writers, Walton, in his work on operative ophthalmic surgery, attributes more than any one else, to faulty muscular action, the production of entropium. In fact, he supposes that the orbicularis muscle is chiefly if not entirely at fault; he bases his treatment on the fact that the tensor tarsi and orbicularis palpebrarum are much thickened and hypertrophied, and that there is an undue excitability in their actions. He says: "The indications are, to overcome the means of the inversion by dissecting away the thick marginal portion of the orbicularis, supposing that part of the muscle to be entirely or nearly all that is at fault; and also to remove as much of the skin of the lid as may be necessary to produce such tension as shall overcome the deformity which other tissues of the lid may have acquired, from the irregular position into which they have been thrown by the muscle, and which has been made more or less permanent by the changes induced by inflammation."<sup>1</sup> As to the manner of operating, he says: "An assistant stands behind the patient, and, having made the lid tense by drawing it outwards and raising the brow, as is shown in trichiasis" (Walton means by "as is shown in trichiasis," the manner in which an assistant should stretch the lid), "the surgeon should make two incisions through the skin and muscle, in the course indicated by the lines in the diagram." The lines in question are two, an upper and a lower one, the latter extending from half a line from the external angle, to within half a line external to the punctum, about a third of a line from the tarsal margin, and parallel to it; the upper one joins the lower one at its extremities, and mounts up, if it be the upper, and descends if it be the lower lid, so that its most convex border being in the centre, is about one-third of an inch from the palpebral one. The flap being made, it should be raised by means of a forceps from the sub-muscular connective tissue, and dissected out by means of vertical strokes of the knife either from left to right or vice versa. Walton advises careful sponging during the operation, and if a small artery spirt, it must be compressed. We have operated in Walton's manner once, and with success, not, however; with the same views in totality, and found all difficulty obviated by using the ring forceps of Desmarres, which controls all hemorrhage, and makes the presence of an intelligent assistant altogether subordinate, as any one can support the head. The dressing of the wound consists in bringing the edges together and

<sup>1</sup> H. W., Op. Oph. Sur., p. 136, Phil. 1853.



supporting them by means of two or more points of suture, and keeping the parts covered with lint, moistened with one part of alcohol and nine of water (as a simple evaporating lotion). Walton states that no applications need be made after the operation, save in excitable and nervous cases, who should be "kept quiet for a day or two, with the lid in as perfect a state of rest as possible. One class of patients will resume their usual avocations directly after the operation, while another will require a cessation from all activity."

There are other procedures applicable to entropia, the cause of which is owing to a spasmodic or permanent contraction of the orbicularis, and which are—

1. The procedure of Wardrop, as modified by Müller, which consists in the incision of the external palpebral ligament, and an excision of a portion of the skin lying over it.

2. The procedure of Janson, which consists in making several small vertical incisions or clippings with a curved scissors, embracing portions of the orbicularis muscle. Desmarres states that this plan has been successful in his hands in recent cases, more particularly if the suture of Cunier be adopted, which causes the adhesion of the skin to the muscle.

Mr. Key<sup>1</sup> practised the excision of a small portion of the orbicularis near the cilia, and then united the wound, which was really more applicable to trichiasis than to entropium, and should be used only in this latter lesion.

3. The procedure of Cunier, which consists in a subcutaneous division of the orbicularis muscle, and which has been practised by various surgeons, more particularly Neuman, Phillips, Pétréquin, and Blackman.

Cunier<sup>2</sup> relates that Pétréquin more than once successfully operated in this manner, and in one particular instance was remarkably so.

The *modus operandi* is in passing subcutaneously a very narrow (myotome) *tenotome* from about the edge of the infra or supra-orbital ridge, as the case may be, to the palpebral margin, and dividing the muscle at its marginal end, and finishing the section with the point of the knife as it is withdrawn. Pétréquin is particularly strenuous in recommending the division of the fibres nearest the palpebral margin, as they are the principal ones contracted in

<sup>1</sup> Lancet, 1825, p. 5, Nov. 8.

<sup>2</sup> Annal. d'Oculist, iv. p. 264.

muscular entropium. The lids during the operation are stretched by means of forceps, and considerable ecchymosis immediately ensues, which is rapidly absorbed, cold water dressing being all that is required.

*Résumé and Appreciation.*—Where so many and varied methods are extolled as being good, by such men as have so done, and whose reputations are world-wide, it is a difficult matter to decide as to the relative superiority of any one. Attention, however, to the physiological and anatomical data upon which they are based lead up to a conclusion. With regard to the method of cauterization proper, it is to be discarded, as it presents various insuperable objections. Thus, the eschar produced may be too small, and the operation must be a second time performed; or it may be too large, and the contraction necessitated upon cicatrization produces an opposite deformity in the production of an ectropium. The action of the cautery cannot always be controlled, and a total palpebral destruction ensues. In a word, the method is unnecessarily cruel, entailing much pain, taking a long time to heal, and offers no advantage over any of the other methods, or even any such appertaining to them.

The method of "forced reduction," counts among its advocates some able men, and is worthy of a trial; but is generally unreliable. Desmarres relates to have seen erysipelas produced by the application of the apparatus composing it. Carron de Villard's method of vesication is worthy of a trial where the entropium results from a relaxed condition of the skin.

The method of "potential cauterization," by means of sulphuric acid, the butter of antimony, chloride of zinc paste, caustic potassa, etc., is not reliable, and the same objections urged against actual cauterization hold in this method, but in a less degree of strenuousness.

The method of excision is generally applicable, and in slight cases the procedure of Celsus is very good; ordinarily in all entropia, the procedure of Dionis is the proper one. In very bad cases the procedure of Janson, or Segond are called for, and that of Haynes Walton is equally applicable. Although Walton's procedure is very good, and is applicable to most every case, I think the physiological data upon which it is based, and the conclusions, although true in the main, are hypothecated upon a foundation of overdrawn physiological data of too exclusive a character.

This report purports to be, and should be, entirely relevant to

the operative parts of defective vision—however, I take upon myself the liberty of going beyond the bounds laid down by the title (“the surgical operations for the relief of defective vision”) and will endeavor to show why I consider Walton’s theory an hypothesis, and his synthetical reasoning not to be correct.

Cunier advised a sub-integumental myotomy, and both he and Pétréquin gave it a fair trial; although successful for a time (in muscular entropium only) the deformity always returned. I have the authority of Desmarres for such a statement, and reason leads to such a conclusion, because the cicatrization of the divided muscle always increased the contraction. Walton’s method consists in excising a portion of the muscle, and also a *portion of the skin*: If the entropium were muscular alone, the excision of the skin is useless, for Cunier’s method would then suffice. Walton, however, advises the cutaneous excision in order “*to overcome deformity which the other tissues of the lid may have acquired, from the irregular position into which they have been thrown by the muscle.*” Now the question arises, is it the muscle which causes the deformity, or vice versa? I think that the muscle has a great deal to do with the production of entropium; but that it is exclusively so, I very much doubt, as in fourteen dissections made for the purpose, I could scarcely recognize the tensor tarsi muscle, and I followed out Walton’s plan in the dissections. The role performed by this little muscle is very much over-estimated by Walton (as the figure delineated in his work was much hypertrophied), for in all of the dissections made by myself, excitement of the muscle by galvanism, by pulling at it by means of small hooks, the action of acids, etc., could not induce the condition of the entropium.

One of the cases (the last one) fortunately was one of long standing entropium in a man aged eighty-two: the orbicularis in this instance was pale and flabby, somewhat degenerated (fatty), and the *tensor tarsi fibres just recognizable by means of a lens*. The subcutaneous areolar tissue was much thickened, the tarsus evidently enlarged, and the skin very much relaxed and elongated. How the muscles alone in this case could be the cause of entropium, is a matter of much doubt in my mind, and until Mr. Walton bases his procedure upon other grounds, I must differ with him as to its physiological construction, although I consider it as one of the best in practice, from the fact that a *portion of integument is excised*.



## CHAPTER V.

## ECTROPION.

Ectropion (έκ, outwards, τρεπῶ, I turn) is an eversion of the lids, by which the conjunctival membrane is exposed to the atmosphere, and is partial or complete.

Many and varied are its causes, such as acute or chronic engorgements of the conjunctival mucous surfaces, various degrees of coloboma, cicatrices either cutaneous or otherwise, cicatricial attachments, or the contractions consequent thereon, tumors in the orbital region, or special causes, such as exophthalmos, buphthalmos, hydrophthalmos, paralysis of the muscles, etc. etc., together with many others too numerous to mention.

With ectropia dependent upon an acute inflammation, the cure of which induces a rectification of the lesion, such as blepharitis, conjunctivitis, etc., this report has nothing to do, but it embraces only such as are dependent upon incomplete union of previous divisions of the lid, vicious cicatrices, muscular contractions, loss of substance, etc., and all others which are never rectified save by surgical interference. These latter are those which present, either, an eversion more or less complete of the tarsus, producing greater or less deformity with epiphora, subjecting the globe proper to all kinds of irritations and inflammations, more particularly vascular, keratitis and opaque cornea, in fact, all of the inconveniences dependent upon the globe's being deprived of its natural protective coverings.

I propose to divide ectropion according as it calls for operative procedure into symptomatic, muscular, conjunctival, tarsal or cutaneous.

I. *Symptomatic Ectropion*.—Symptomatic ectropion is, as above stated, dependent upon some other cause, such as a tumor in the orbital region, hypertrophy of the lachrymal caruncle, corneal staphyloma, etc. etc., and disappears when the cause is remedied.

II. *Muscular Ectropion*.—Muscular ectropion is exceedingly rare, and only takes place in the lower lid. It is met with in the aged, or very much debilitated individuals, and doubtlessly depends on a want of tone in the orbicularis palpebrarum, which does not contract with sufficient power to hold up the superincumbent weight

of the lid. Velpeau seems to think that this variety of ectropion is dependent upon a spasmodic contraction of the muscle, but it seems to me that the learned professor of "*La Charité*" is at fault, and has evidently confounded it with Key's method of operating in *entropium*, which consists in uncovering the muscle and excising a portion of it, thereby producing an opposite condition. Velpeau advises this method, and has performed it with success, but evidently has mistaken the *casus pathologica*, as an *ultra contraction of the orbicularis produces entropium*. Desmarres makes another cause of muscular ectropion, which consists in the tendon of the muscle being divided by accident, or frequently through the *mal-addressé* of the surgeon in operating for fistula lachrymalis.

This variety is rather musculo-symptomatic than otherwise, as proper bandaging, etc., to unite the divided tendon causes rectification of the deformity.

III. *Conjunctival Ectropion*.—Conjunctival ectropion, or such as can be remedied by an operation upon that membrane, is perhaps the most frequent variety of the lesion. When the conjunctiva is covered with granulations and voluminous vegetations, or is in a tumefied condition, excision is the proper treatment, and many methods have been devised in accordance with the amount of surface involved.

Paulus Æginetus perforated the conjunctiva from one commissure to the other with a long needle, and then clipped off the offending part by means of scissors. Scarpa and Roux used, instead of the needle, a tenaculum, and proceeded as did Paulus Æginetus. Instead of the needle or tenaculum, and from the great liability of these instruments to be torn out, one or several threads are passed through the base of the tumor, and it is thus raised from its bed and dissected off: such is the recommendation of Desmarres, and this procedure has been advised by Bordenave, Severin, Richter, and Bartisch. The excision in all cases should be in the horizontal diameter of the lid. The edges of the wound should be approximated as much as possible, which is easily done by the lid's being placed in its normal position, and there maintained by means of adhesive straps, bandages etc. Cold water dressings are then applied, and in a few days cicatrization is complete. When, however, the conjunctiva presents no tumefaction, as is frequently the case, particularly with old persons (ectropion senilis), or when a slight contraction of the skin takes place, other operations have been de-

vised, such as that of Guillon Dolois,<sup>1</sup> wrongly attributed to Bordenave, with modifications by Dzondi and by Lisfranc, which consists in addition to the excision of the conjunctiva, that an excision should be made through the lid at its base, extending from one commissure to the other, and semilunar in shape, and retained patulous by means of charpie, lint, or a metallic plate of some kind. This operation has been frequently credited to Lisfranc; but the honor of it is due to the old Lyons surgeon, the father of French Ophthalmology. The other operations are those of Antyllus and Dieffenbach.

Antyllus dissected off a delta-shaped flap (thus  $\Delta$ ) of conjunctiva, the base of the triangle extending along the margin of, and about half a line from the tarsus, comprising the whole length, except about a line from the external angle, and a line from the punctum; the apex of the triangle being about five lines from the base. The edges of the wound are brought together by means of sutures. Desmarres' advice contraindicates sutures; he also states with Bordenave and Pétréquin, that it is not absolutely necessary that the flap should be triangular in shape, or even in the centre of the lid, but that a dissection of a quadrilateral, or an oval, or an ellipsoid flap, from the horizontal diameter of the lid answers just as well, and that no sutures need be applied, a simple astringent applied the next day answering all purposes requisite.

The procedure of Dieffenbach consists in making an external incision through the whole thickness of the lid, down to the conjunctival membrane outside of the adherent border of the tarsus; the conjunctiva is then dragged out of the wound and attached to its lower flap by means of the suture pins and the twisted suture; the upper flap of the incision is not embraced in the pins, whereby, according to Chelius, an abundant suppuration is avoided. This operation is condemned by Desmarres, and not much thought of by Velpeau, although Cunier, Carron du Villards and Lisfranc think highly of it; Serre,<sup>2</sup> however, relates that it entirely failed in his hands.

IV. *Tarsal Ectropion*.—Tarsal ectropion is ordinarily the result of a chronic purulent conjunctivitis, palpebral abscess, blepharitis, etc., in which the tarsal cartilage loses its normal elasticity, and becomes much elongated and badly shaped. Various operations

<sup>1</sup> Cours de Médecine, in 4°. Lyon, 1678, par. Guillon-Dolois.

<sup>2</sup> Vide Desmarres, vol. i. p. 516.



have been devised for the rectification of the deformity, the most prominent of which are those of Reil, Walther's modification of Ledran, and of Adams.

Reil's procedure is to excise the tarsal cartilage, as does Gerdy in entropion; this procedure is nothing more nor less than a mutilation, and deserves universal condemnation.

Walther's modification of Ledran, or *tarsoraphia*, is applicable more particularly to double ectropion, and consists in the excision of the tarsal edges of both eyelids, the external angle of the commissure and a piece of the adjoining integument of the temple, the whole forming a triangle whose apex is external, the base being towards the eye; the parts are then brought together, and united at two points by suture-pins.

Adams's procedure consists in the excision of a triangular portion of the whole thickness of the lid (the apex towards the base of the lid). This delta incision ( $\Delta$ ) must be modified according to circumstances, and the base as accurately measured as possible. The edges of the wound are then brought together by means of sutures, the first always being taken at its tarsal margin.

Dieffenbach has modified this method (Adams's) by making two elliptical incisions and uniting them above or below (horseshoe shaped), and some time afterwards proceeding to unite the divided lids as for coloboma.

Middlemore<sup>1</sup> regarded Adams's operation as a miserable imitation of Antyllus; Cunier thought it the method of Guillon Dolois. Antyllus's method has been described above, and Guillon Dolois simply described it. This method has also been ascribed to Physick and Bouchet; but Adams was the first to perform it, as a careful study of the history of the operation fully points him out as its author.

Maisonneuve has devised an ingenious method for the rectification of tarsal ectropion, which consists in denuding the tarsal edges of the lids from the external angle to the puncta, and bringing them together by means of sutures; union having taken place, they are left in that position for months, or even a year if necessary. The tears pass out by their normal passages at the inner canthus. Maisonneuve reports several cures. When it is thought the deformity has been remedied, the adhesions are divided, and the edges of the lids touched with nitrate of silver, etc., to prevent a reunion.

<sup>1</sup> Middlemore, vol. ii. p. 792.

Nélaton condemns this method, and states that the results of this operation are not permanent, that it interferes with the Meibomian secretions, and the pilous bulbs, from the freshening of the edges, and renders both lids deformed instead of one.

V. *Cutaneous Ectropion*.—Cutaneous ectropion, or that involving an operation primarily upon the integument, is generally caused by a burn, an ulcer, an anthrax, a suppurating wound, or some traumatism, and the contraction necessary upon cicatrization renders this form of the disease the most formidable as regards its surgical treatment.

Many operations have been devised, some of them being applicable to special cases, others coming under the head of generalities. We will endeavor to distinguish between them.

The first variety, cutaneous ectropion, depends upon a simple contraction of the skin resulting from a cicatrix, and its proper treatment is the operation of Dieffenbach. In cases of this character the Berlin surgeon removed the cicatrix by means of a triangular dissection, the apex of which was towards the base of the lid, whereas its base extended towards its free border; the dissection being completed, the incisions were extended from each end of the base line, and the lateral portions of the triangle were slightly raised. By this means when the edges of the wound were brought together, the two sides of the triangle formed a perpendicular line, and the prolonged base a horizontal one at right angles to it. This operation is exceedingly ingenious and completely fulfils the expectations as to its results. I have once performed it, greatly to the relief of the patient, and to a rectification of the ectropion.

In certain cases, when there is considerable contraction of the skin, but sufficient looseness of the subcutaneous connective tissue, Mr. Wharton Jones has devised a very ingenious procedure, which consists in pushing the lid into its normal position, by means of certain incisions, as follows: The success of the operation depends upon the looseness of the subcutaneous cellular tissue, and hence it has been advised to move the lid up and down, for a number of days previous to the operation, in order to break up any adhesions, and to render the tissue more yielding. The operation consists in making two incisions embracing a triangular space, one of which is made from over the external, the other from over the internal angle of the eye, both of which converge to a point some-

what more than an inch above the eyebrow.<sup>1</sup> The incisions having been made, the triangular flap is then pressed down, dividing, if necessary, all connective bridles of cellular tissue (without separating the flap from the subjacent textures) until it assumes its normal position. If there be any exuberant conjunctival substance, it should be snipped off, and the edges of the wound, left gaping in consequence of the depression of the lid, are brought together by sutures, and the eyelid retained in its position by the necessary adhesive straps and bandages. This operation is highly lauded by the British surgeons, among whom Walton, Gay, Mackenzie, and Wilde dwell upon it with particular favor.

This procedure is but a borrowing, as it were, of Franco's precepts of sliding, and practically applying them to the lid, and may be considered under the general head of blepharoplasty. This, together with Dieffenbach's operation above described, may be ranked together as anaplastic operations, and might be more properly ranked under the head of blepharoplasty as applicable to ectropion, to be considered further on.

The procedure of Celsus, or a simple incision of the cicatrices, is perhaps one of the oldest in existence. From its results it could scarcely merit a detailed description, although its history is one of interest, as it has been modified and performed by the illustrious of the profession, such as Albucasis, Guilleman, Heister, Dionis, Fabricius D'Aquapendente, Beck, Richter, Acrel, Pellier, and M. A. Petit, and in modern times, rendered somewhat famous by the labors of a Lisfranc and an Amussat.

It consists in a crescentic incision being made through the cicatrix, the concave border of which, in the upper lid, looks towards the tarsus, and the convex border in the lower lid being also turned towards its margin. The wound is maintained patulous by means of charpie, lint, etc., until granulation takes place. The wider the cicatrix, the more beneficial the result. Maitre Jan, Fabricius de Hilden, Bordenave, Scarpa, and Richerand, condemn this operation, and Desmarres does not seem to think much of it, although he states, that if it is chosen, the advice of Amussat should be followed, which consists in daily breaking up the so-called pyogenic membrane, in order to induce as much granulation as possible; and having so done to maintain the lid in its position by means of ag-

<sup>1</sup> This method has, as far as I am able to discover, been applied to the superior palpebra: but it evidently is equally applicable to the inferior one. At any rate it is worthy of a trial, as its simplicity and readiness of execution should entitle it to such.



glutinative straps (Solingen) or by means of threads attached to the head, nose, etc. (Acrel). When there has been destruction of the integument of the lid, inducing ectropion (or of the lid in totality), blepharoplasty is the only resource. In this variety of ectropion several prerequisites to an operation must be considered, viz: that there be no local inflammation, that the patient be in sound health, that some portion, at least, of the tarsus be present, as this, of all others, is the most necessary framework for an operation; that the flap be nearly twice as large as the space which it is to occupy; that the pedicle be sufficiently large, vascular, and thick, and that it be attached as near the free margin of the lids as possible.

*Blepharoplasty.*—Up to 1817, but little attention had been paid to blepharoplasty as a special department of ophthalmic surgery, and not until 1833 was it much recognized, even in Paris, when Roux proclaimed to the world that it was a triumphant achievement, and a valuable acquisition to operative medicine.

In 1817, Graefe, of Berlin, published a successful case; in 1818, Dzondi was also successful; Fricke, in May, 1829, made the most decided advances in the method, and succeeded in establishing it as a success.

Jüngken, in Vienna, during the same year, published several successful cases, in which permanent cures had been established. Langenbeck, Rust, and Blasius, in their respective general treatises in '29 and '30, also noticed and recommended it. Staub, of Berlin, in 1830, published a monograph on the subject, as did Dryer, of Vienna, in 1831. Peters, in Leipsig, in 1836, published quite a book on the subject, which for many years was standard authority. Since which period, Ammon, Blandin, Jobert, Robert, Carron du Villards, Boyer (de Saintes) A. Bérard, Schwaerer, and Burow, upon the continent of Europe, Middlemore, Wileox, Wilde, Walton, Mackenzie, Liston, and Bowman, in Great Britain; and Parker and Carnochan, of New York, Warren, of Boston (father and son), Kearney Rogers, of New York, Smith, of Baltimore, and Pope, of St. Louis, have by their skill and success performed blepharoplasty in so many cases, that it is at the present day one of the most frequent of operations in ophthalmic surgery.

There are three great methods which, for ingenuity, in the whole range of surgery stand without rivals, and which are known as the Indian, the method of Franco, and that of Velpeau.

The Indian method first proposed by Graefe, and adopted by

Fricke and Dzondi, consists in excising the cicatrices, if any exist, or loosening the *débris* of the lid from its subjacent attachments, in order to make a regular wound : if no cicatricial tissue exist, or if there be but a simple contraction of the integument, a longitudinal incision suffices. This having been done, a flap of skin is taken from the adjoining parts, which must be a little larger in order to allow for the contraction of cicatrization, and accurately attached in the denuded space of the lid by means of the interrupted or twisted suture. It is well to mark the shape of the flap, before the operation, with a pen and ink, or by means of the nitrate of silver. Fricke, who performed more of these operations than any one else in his day, and who has been followed more or less by every one since, took his flap for the upper lid from above the external extremity of the superciliary ridge, and attached its anterior margin to the inferior one of wound in the lid, whilst the posterior margin was attached to the superior one of the wound. For the lower lid, he took his flap from over the external border of the malar bone, and attached it to the lid, merely reversing the margins from the method applicable to the upper lid.

Ammon has modified this operation by making the wounds at right angles to each other, shaped like a capital L, so that when the horizontal wound of the lid is to be filled, the vertical flap is adjusted therein, and when the operation is complete, the relation of the wounds to each other are reversed. Velpeau thinks that is a valuable modification.

That which is generally known as Dieffenbach's procedure, is in reality but an application of Franco's method of sliding. This method consists in a lateral transposition of a triangular flap without twisting the pedicle. The first steps of the operation are to prepare the lid for the reception of the flap, by excising the cicatrices, if they exist, being careful to retain the tarsal cartilage if possible ; if it do not exist, and the conjunctiva does, this membrane should be dissected from its attachments and spread over the globe, remembering, however, to give the denudation a triangular shape with its basis parallel to the cartilage. A flap is then to be dissected from the temporal region, of a trapezoid shape, its base line corresponding to that of the wound in the lid, but considerably longer, being carried towards the zygoma, the internal incision of the flap corresponding to the external one of the denudation, and its external one commencing at the end of the base line, and extending upwards and forwards (if it be the upper lid), downwards

and forwards (if it be the lower one), but somewhat longer than the internal one; the attachments of the integument are then separated with the exception of its pedicle, and it is then accurately adapted to the lid or conjunctiva as it may be, by means of sutures, and the parts whence it was taken left to granulate. Dieffenbach, Lisfranc, Ammon, Eckström, Blasius, Velpeau, Fricke, and Chelius, have successfully performed this operation. Chelius is the only one who united the tegumentary denudation by means of sutures; but as it endangers the flap, too much dragging being placed on it, it has most justly been condemned by all other surgeons.

Velpeau's method consists (for the lower lid, as he never applied it to the upper one) in a mixture of the Indian and of Franco's method, although essentially differing from either one of them. He first frees the cartilage from its attachments, and then makes a triangular flap, the apex of which corresponds to the root of the nose immediately over the lachrymal sac, or the external orbital apophysis, as the ectropion may be more predominant externally or internally, the base of which overlies the malar bone. He then dissects the flap from above downwards; dividing more of its facial than its orbital attachments; having done this, he cuts off about one-fourth of the triangle at its apex; the next step consists in attaching its truncated apex higher up by means of sliding, and its base line whence the former was taken. The relaxation given the lid by this method is, according to its author, very great. Velpeau seems to think that a double operation of this character might be performed on the same lid, and with success. It is an exceedingly ingenious operation, and is worthy the consideration of the profession.

With respect to blepharoplasty in general, the most elegantly executed operation will sometimes fail, and an irregularly shaped piece of skin will be the result; and, it cannot be presumed that a transplanted tegumentary flap can or will assume the functions of the lost eyelid. It may in a measure so do, if the muscular structure remain; but if that be gone, it will not. However, if the adhesions are perfect after an operation, and the globe proper is well covered, whatever may be the shape of the lid, many evil consequences are avoided, by protecting it from atmospheric, solar, and other extraneous influences. I have seen several very perfect results from blepharoplasty, among which I can recall one, performed by Prof. C. A. Pope, of St. Louis, upon the left lower lid of a girl suffering



from a complete ectropion, the result of a severe burn : in this case the flap was taken from the cheek, and attached to the tarsus, after Fricke's modification of the Indian method ; four days after, the sutures were removed, immediate union having taken place and the flap looking perfectly healthy. In this case the lid functioned very well, and it could be called a perfect cure. It may be deemed inappropriate in a general report to specialize individual instances of operations ; but the above was so beautifully and elegantly performed, so thoroughly indicative of the master surgeon, that I could not refrain from adding another humble testimonial to an already wide and extended reputation.

*Appreciation and Résumé.*—When an ectropion is but slight, and there is no loss of substance, too great a stretching of the tarsal cartilage, the operation of Antyllus is by far the best of all others. If there be very great elongation of the cartilage, particularly in old people (*ectropion senilis*), the operation of Adams is the best. When there is loss of substance, of the various blepharoplastic procedures, that of Fricke seems to answer the best. When there is an ectropion, the result of cutaneous contraction simply, the operation of Wharton Jones best fulfils the indications. The procedure of Walther is good in special cases only. All of the other procedures are extremely ingenious, but lack simplicity, and as "brevity is the soul of wit," so is simplicity that of surgery.

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## CHAPTER VI.

### STRABISMUS.

Contrary to the proposed idea of discussing only the operative procedures of such lesions of vision as are considered in this report, I find it absolutely necessary to consider the literature and pathology together with such operations as have been devised for the cure of strabismus.

The cure of strabismus by operative procedure was first performed in 1737, by Taylor, a wandering charlatan, who wrote a monograph on the subject, entitled *De Verâ Causâ Strabismi*. Taylor pretended to miraculous results, and had announced in the *Mercur de France*, June, 1737, that "Dr. Taylor, oculist to the King

of Great Britain, has just arrived in Paris, residence at the London Hotel, Dauphine Street, where he intends to remain until the beginning of July, when he goes to Spain. He asks of us to publish the discovery which he has made of the rectification of squinting eyes, by means of a simple and almost painless operation, unattended with any danger of accident."<sup>1</sup> Walton thinks, as does Velpeau and others, that the operation consisted in a division of the lateral recti muscles, although no definite conclusion can be attained, as Taylor kept his method a profound secret. Heuerman, of Leipsic, "On the Newest Surgical Operations," in 1756 condemned the operation, and from that period until 1838 it was entirely abandoned upon the continent, although it was practised in England in 1767, as Vekeyden,<sup>2</sup> in his *Dissertatio Morborum Oculorum*, makes use of the following language: "*Strabones per mullos ferra sanatos apud Anglices vidi.*"

In 1833, Stromeyer published a work on the subject in question, giving full physiological and anatomical data upon which the operation was based. He had not performed it upon the living subject, having demonstrated its utility and success upon the cadaver. The following year, Dieffenbach and Cunier<sup>3</sup> almost simultaneously had the honor of first practically applying the magnificent theory of the Hanoverian surgeon. Just one hundred years intervened between the works of Taylor and Stromeyer; the charlatantry of the one was buried in oblivion, whereas the scientific and enlightened discovery of the other gave to the world the benefits accruing from such an operation, and it will ever be a monument to human fame "more durable than brass," and more elegant than Carrara's chastest marble, carved with the exquisite grace and symmetry of even a Michael Angelo.

The reason of this deviation from the prescribed plan is owing to the fact that the profession is not altogether satisfied as to the propriety of the operation. I am fully satisfied that many valuable monographs have been written on the subject, and that an objection might be raised to any further treatment of it. However true the objection may be, and however much may have been written on the subject, I think that an investigation of the opinions of the

<sup>1</sup> Bibliothèque du Médecin Practicien (Strabisme), 1849.

<sup>2</sup> Supplement des Annales d'Oculistique, p. 258.

<sup>3</sup> Cunier pretends to have operated two months prior to Dieffenbach, in October, 1839. The Berlin surgeon, however, according to Phillips, operated on the 26th of October, 1839, not in December, as Cunier supposed.

most distinguished of the profession is worthy the attention of all lovers of truth.

Strabismus (*στράβος*, squint, *στρεφῶ*, I turn) consists in a want of parallelism of the axes of vision, or, in other words, the impressions which an object makes upon the retinae do not fall upon corresponding points.

*Varieties.*—Strabismus may be internal (convergens), or external (divergens), or superior (ascendens), or inferior (descendens). The internal is more common than the external, which is in its turn more so than either the superior or inferior variety. Baudens describes three other varieties which may be designated under the common head of complicated strabismus, which are—

I. *Parallel strabismus*, or one eye convergent, and the other divergent.

II. *Terrible strabismus*, or one eye looking upwards and the other looking downwards.

III. *The fixed double divergent.* Desmarres adds another variety, which is the *double alternative strabismus*, which most frequently is convergent, and in which vision is equally good in both eyes.

As was above stated, convergent strabismus is more frequent than divergent, and Bonnet<sup>1</sup> states that in a hundred cases ninety (90) will be convergent, and only ten (10) divergent. Notwithstanding the varied experiments induced to arrive at the cause of the greater frequency of convergent strabismus, no satisfactory reason has, as yet, been given. It was formerly, and is now held by some surgeons that the hyperaction of the oblique muscles caused it, which is nothing more than a *quid pro quo*; and besides, Hélié<sup>2</sup> and Bonnet have most effectually proven that these muscles tend to roll the eye outwards upon its antero posterior axis. A. Bérard has given probably the most satisfactory explanation, which is that the eye has a natural tendency to convergence, as is illustrated by the flow of tears, and that an exaggerated muscular action of the internal rectus would be more liable to so remain than such of the external rectus.

The priority of the operation, its discovery, description, and application, after a lapse of nearly a quarter of a century, may be definitely settled, and the honor accorded to whom it is due. Ac-

<sup>1</sup> *Traité des Sections Musculaires et Tendineuses.*

<sup>2</sup> *Thèses de Paris, 1841.*



cording to Walton, M. Anthony White, of Westminster Hospital, proposed, in 1829, the division of the recti muscles for strabismus.

Baudens,<sup>1</sup> and Cunier, have both the following words, the former quoting from the latter, in such a manner as indicates his sincerity in its belief. "It is a long time since an Italian physician advanced the theory that strabismus, the result of spasmodic contractions of one of the straight muscles, seemed to him to be curable by means of a section of the muscle. Notwithstanding my researches and efforts of memory, it is impossible to call to mind the name of this surgeon. I will state, however, that Dr. Baschieri, of Bologna, whom I knew at Montpellier in 1837, whither he had gone as a refugee, frequently called my attention to the operation of myotomy advised by his countryman, and even persuaded me to have recourse to it, upon one of my relations affected with convergent strabismus of the right eye, who was cured by the use of the bandage.

"It was reserved for a Belgian, Mr. J. Guérin, to demonstrate by experiment, the possibility of curing strabismus by the section of that muscle which destroyed by its undue contraction the equilibrium of antagonism. Since 1837, Guérin has described in his lectures the operative procedure which seemed to him to be the most suitable. He would apply the subcutaneous method in the section of the straight muscles. I will particularize farther on concerning this procedure, with my experience, together with the experiments performed by my countryman, upon the dead subject in the presence of several physicians, among others M. Seutin, in the years 1837-38-39."

Cunier,<sup>2</sup> in pursuing this subject, says: "In 1838 Professor Stromeyer wrote in his *Beitrag zur operative Orthopädie* the following lines." "The various attempts made upon the dead subject induce me to recommend the operative procedure for strabismus of a spasmodic nature."

"The healthy eye is caused to be closed, and the patient is directed to turn the affected eye, as much as possible, from the vicious direction in which it is held. If it be convergent strabismus, an intelligent aid is intrusted with a fine hook implanted in the conjunctiva with which the eye is drawn out. The conjunctiva having been raised by means of forceps, an incision is made in it, at its inner canthus with a cataract knife. The outward traction is increased until the internal rectus muscle is made apparent; a small

<sup>1</sup> Baudens, *Leçons sur le Strabisme et le Bégaiement*, p. 5.

<sup>2</sup> Cunier, *De la Myatome applique au Traitement de Strabisme*, p. 1 et seq.

stylet is then passed under it and it is divided by means of a curved scissors, or with the knife with which the conjunctival incision was made. The immediate after-treatment consists in the application of cold fomentations, and the administration of an opiate. The eye should for some period of time be maintained closed, to the end that exercise should have sufficient time to re-establish its normal movements. *Orthopædic practice proves that it suffices to divide a muscle, to cause the cessation of spasmodic action with which it was affected, and to render it apt to resume its functions.* As to the above described operation, it need not be more dangerous than the extirpation of encysted tumors which rarely compromise the eye."

In October, 1839, the first operation for strabismus was performed, and as to the question of priority, the united voice of the profession have given it to Dieffenbach, although Cunier claims to have performed it two months sooner, and in speaking of it, he says:<sup>1</sup> "That as Stromeyer had not sufficiently indicated as to how the lids should be maintained separated, he felt the greatest difficulty in keeping them properly opened," which circumstance prevented<sup>2</sup> Pauli of Landau from operating at all, as he attempted to operate upon a girl of fourteen (14) years of age, whose eyeballs were very movable, but having torn the conjunctiva in three places he abandoned the operation. Verhaehge, a countryman of Cunier's, and who had also been operated upon by Dieffenbach, denies the claims to priority set up by the Belgian, over those of the great Berlin surgeon. Phillips, in 1839, in a letter to the Academy of Medicine of Paris (as also Dieffenbach, Nov. 1839, and Feb. 1840), details the account of the first operation performed by Dieffenbach upon a boy aged ten (10) years, "which was long and laborious, though successful," and the operative procedure was that indicated by Stromeyer. The five or six succeeding operations as performed by Dieffenbach were totally unsuccessful, as he followed the rules and indications of Stromeyer, but on the 1st of March, 1840, he operated upon a young Belgian surgeon, M. Verhaehge by "the new method of Dieffenbach" (to be described farther on), with the most marked success. It was the letter of Verhaehge<sup>3</sup> which gave such a stimulus to the operation in Belgium and England. Mr. Lucas had already successfully operated upon several individuals in London, when the second letter of Dieffenbach reached the Institute in Paris

<sup>1</sup> Cunier, loc. cit.

<sup>2</sup> Bourgery, De la Strabisme, p. 7.

<sup>3</sup> Letter of March 31st, 1840, Annales des Sciences naturelles de Bruges.

in Feb. 1840, and which directed the attention of the French surgeons to the importance and brilliancy of the operation. Unfortunately, the directions were so stupidly followed, or were not understood at all, that the first attempts failed in toto, in the hands of such eminent men as Roux, who failed twice, Amussat once, Sedillot once, Guérin twice, and Velpeau in six or seven cases. This was in July, 1840, and a commission consisting of the above named surgeons was appointed to report upon the subject; and, through its chairman Amussat, was about to report adversely; but fortunately was detained some few months. When Phillips<sup>1</sup> came to Paris in November, he found this state of affairs; he, however, did not despair, but in a sitting of the Academy, Nov. 15th, 1840, he performed in a most triumphant manner the operation of strabismus according to the method of Dieffenbach, upon seven cases. MM. Amussat, Lallemand, Pinel, Grandschamp, Baudens, Lisfranc, and Velpeau, witnessed the operation, and unanimously accorded in its favor.

As in all brilliant discoveries there are some who lay claim to priority, without the least foundation of truth, this one underwent the usual ordeal. Notwithstanding Cunier's claiming for himself the honor and prestige of the discovery, Carron du Villards also contests the palm with Stromeyer, for in a letter published in the *Bulletin de Thérapeutique*, he claims to have operated the first one. Another physician, M. Delasiauve, claims priority for Gensoul in a letter communication to the Academy of Medicine, in which he states that he (Gensoul) had demonstrated it to Dieffenbach upon the dead subject whilst on a visit to Berlin; but says Phillips (*loc. cit.*), "this communication appeared four months after Stromeyer's publication," and Gensoul himself does not seem to have pushed his claim with any degree of vigor. The most serious obstacle in the way of Stromeyer as to his priority, lies in a publication made by Sammels de Courtray, who states to have successfully operated in 1826 upon two workmen, one in Lille, the other in Roubaix, and whose names he mentions! Verhaeghe<sup>2</sup> denies these statements and strongly battles for Stromeyer and Dieffenbach, and is rather severe upon all other aspirants to the honor. After a careful investigation of more than one thousand pages on the subject, the conclusions arrived at are, that, as with many other great discoveries,

<sup>1</sup> Phillips, *Tenotomie sous-cutanee*, p. 237.

<sup>2</sup> Verhaeghe, *Lettre, etc.*, *loc. cit.*



the exact origin and date of this is unknown, and that for at least a century, perhaps longer, the cure of strabismus by operative procedure has been known and practised; furthermore, that like many other important operations of the human intellect, as indicating the similarity of genius during certain epochs, when actions are shaped by a peculiar chain of circumstances, the same idea may be, and is conceived by separate individuals. Thus the Italian whom Baschieiri mentioned to Cunier seems absolutely to be the first, then J. Guérin, and then Stromeyer who so forcibly advanced the idea, that to him the profession has bestowed the titles of originator and inventor of the operation for the cure of strabismus. Finally, to Dieffenbach the credit is due of having first successfully performed the operation, and having thus materialized and realized the idea, having given birth to the fact of a century's age, of having cleaned the dust of ages from the mouldering truth, he deserves the honor of being considered coinventor, and coadjutor to Stromeyer, and hand in hand, their names coupled upon the tablets of memory, they should be looked upon by all surgeons as deserving the thanks of all philanthropists, and, in letters of gold, inscribed upon the scroll of immortality, should ever hereafter be seen the words, "Stromeyer, Dieffenbach."

*Etiology.*—The causes of strabismus are many and varied, which may properly be reduced to two orders, viz: the *mechanical* and the *visional*.

Under the head of the mechanical order may be placed all obstacles to a normal motion of the globe proper, such as tumors of the orbit, of the sclerotic, particularly such as are produced by posterior staphylomata (Desmarres), and symblepharon the result of traumatism or abscess, etc. Phillips adds to this order diseases of the muscular appendages, such as contraction or paralysis, which is nothing more than a mere symptom of disease of the third, fourth, or sixth pair of the cranial nerves.

The second order, or the *visional* causes of strabismus, are such as may induce even temporarily a want of parallelism of radiation. Under this head may be ranked the habitual use of one eye as inductive of strabismus. Wardrop and Desmarres each detail an interesting case of such. Again sex, climate, and profession exercise certain influences which tend to its production; thus, watchmakers, who habitually use one eye in the examination of their work, are exceedingly liable to the affection. Cunier and Desmarres have both noticed this peculiarity in watchmakers.

These visional causes may be remote or exciting, thus, strabismus may be hereditary if not congenital. Desmours believes that it is congenital and dependent upon an arrest of development of the muscles of the eye; as did Dufresne-Chassaigne,<sup>1</sup> who collated fifty-four (54) cases, of which thirty-four (34) dated from birth. Kessler,<sup>2</sup> however, thought differently, and stated that congenital (so-called) strabismus depended upon a bad habit acquired by the infant, when at the breast, of looking obliquely at the light. Whatever may be the fact, it is very certain that strabismus manifests itself at a very early age. Payre<sup>3</sup> gave some valuable statistics on the subject. In forty-four (44) cases happening to himself, thirty-two (32) of them were made manifest before the age of six years. In another table of one hundred and sixty-three (163) cases reported by other surgeons, strabismus occurred in the first six years of life in one hundred and nineteen (119) cases. From these tables, then, it appears that nearly seventy-five (75) per cent. of all cases occur in early youth, and depend upon the peculiar affections to which that age is liable. As to strabismus being hereditary there cannot be the shadow of a doubt, as it is a most common occurrence. The peculiarity of this heritage is that the disease is developed about the same period of life in which it first made its appearance in the parent, uncle, or aunt, as the case may be.

Strabismus is frequently the result of brain disease, such as ramollissement, apoplexy, epilepsy, hydrocephalus, tubercular cerebritis; and squinting is one of the earliest symptoms of the last mentioned disease. It is also dependent upon the reflex irritation of costiveness, worms, and teething. The emotional causes are also frequent, as strabismus has been known to follow a great fright, a violent fit of anger, great grief, etc. etc.

Dr. Radcliffe Hall,<sup>4</sup> in his valuable paper on strabismus, presents the causes of two hundred (200) cases; although he does not vouch for their absolute correctness, he thinks them true in the main.

#### *1st Class.*

9 Cases from convulsions during infancy.

7    "    "    falls on the head.

<sup>1</sup> *Traité du Strabisme et du Bégaiement.*

<sup>2</sup> Verlegh. *Mémoire sur le Strabisme*, p. 21.

<sup>3</sup> Payre, *Traité du Strabisme, et de sa cure radicale par la section musculaire.* Paris, 1842, in 8vo.

<sup>4</sup> *London Medical Gazette*, vol. xxvii. p. 642.

- 1 Case from severe concussion of the brain.
- 3 Cases " difficult dentition.
- 2 " " whooping-cough.
- 3 " " intestinal worms.
- 2 " " epilepsy.
- 1 Case " a severe thrashing.
- 1 " " excessive fright.

*2d Class.*

- 2 Cases " ophthalmia, which left no opacities.
- 5 " " opacity of the cornea.
- 1 Case " " " " said to have formerly existed.
- 2 Cases " wound of cornea by a stocking needle.
- 1 Case " " by a fork.
- 2 Cases " " " thorn.
- 5 " " blow in the eye.
- 1 Case " burn " " by a piece of metal.
- 2 Cases " habit of looking at the sun.
- 2 " " a cartwheel going over the orbit.
- 2 " " amaurosis.
- 3 " " imperfect cataract.
- 3 " " exposure during infancy to a bright and very hot fire.

*3d Class.*

- 39 Cases " imitation of some other squinting persons.
- 1 Case " watching the motions of a shuttle.
- 1 " " voluntarily trying to squint.
- 1 " " habit of looking at a scar on the eyebrow.
- 2 Cases " " " " " " " nose.
- 2 " " " " " " " cheek.
- 1 Case " " " " " small encysted tumor on the inner canthus.
- 1 " " habit of looking at a small nævus on the inner canthus.
- 1 " " habit of looking at a mole on the nose.
- 1 " " sucking thumb and looking steadfastly at it at the same time.
- 3 Cases " habit of holding the head sideways whilst knitting.

*4th Class.*

- 4 " " measles.
- 4 " " smallpox.



*5th Class.*

2 Cases from severe burns of abdomen.

4   "   "   congenital.

73   "   "   unaccounted for.

Mackenzie states concerning these statistics, that it appears probable that in the first and fifth classes an equal communication of nervous energy to the muscles of the eye, in consequence of the disease in the brain or its vessels, is the origin of the distortion. In the second and fourth classes, the distortion is probably at first an effort to free the eye from pain, or the results of such disease of the eye, and of its natural movements, as must often arise from wearing a shade over one eye. In the third class strabismus arises from habit. It thus appears that most cases of strabismus can be referred to some one cause which is included in Hall's tables. Whatever may be the cause, strabismus once being developed, the contracted muscle being antagonistic to its fellow, which is relaxed, it gains at the expense of the latter in a double sense, for the contracted muscle becomes in a measure hypertrophied from constant use, and the relaxed muscle atrophies or becomes less strong from disuse.

Diplopia is always the necessary result of strabismus, and is readily understood, as the image of the object seen does not fall on corresponding points of both retinæ. The experiment of Macdonald (to be noticed farther on), as a test to discover which eye is deviated, also explains why there is double vision. The deviated eye generally, if not always, is not used; the healthy eye performing the functions of vision. Amblyopia is always attendant upon the deviated eye, and is primarily owing to the diplopia; this, however, does not fully explain it, as other causes conjoin in its production.

Where there is double strabismus, or even when there is but the simple variety and the individual cannot control the diplopia, by using the sound eye alone, an opaque glass, or a shade, should be worn over the squinting eye, thereby preventing an image from falling on the retina, and thus producing diplopia.

The reason why amblyopia follows diplopia or is caused by it, is readily explained upon physiological data. The most sentient spot of the retina is a little outside of the optic nerve, its functional activity diminishing postero-anteriorly, so that, when the ciliary bodies are reached, the power of transmitting an impression to the

brain is almost, if not totally lost; hence in a case of convergent strabismus the luminous rays impinge upon a spot of the retina more or less external to the visual centre. Now, a single vision with two eyes is produced by a series of alternate impressions upon each retina,<sup>1</sup> it follows most conclusively that the confusion resulting from unequal impressions converged to the sensorium must terminate in a preponderance in favor of one eye, and that one the healthy one; the other becoming more or less amblyopic. It thus appears that amblyopia is the result of a physical cause, the impinging of rays upon a moderately sensitive portion of the retina, and an epiphysical one, the confounding of sensorial impressions.

Amblyopia and diplopia are not the only inconveniences of the affection, for, as above stated, the squint eye is frequently not at all used, and relative myopia is the result, *i. e.*, but one eye is used, and no visual angle is formed, as the greater the angle the better the sight for distant objects (all the functions of the eye being normal, viz: accommodation, sensitiveness, etc.), and it requires both eyes to form such an angle.

Sometimes there is absolute myopia, or there may be amaurosis, symptomatic of a variety of causes, such as a diseased brain, or the many intra-ocular lesions discoverable by the ophthalmoscope.

In double strabismus there may exist all of the complications attendant upon the simple variety, and when it is determined that there is such a condition as the double variety (the diagnosis of which will be considered farther on) the stronger eye is less deviated than its fellow, or, in fact, the weaker eye alone remains constantly displaced, the other appearing normal; only occasionally being dragged inside of the central axis, or outside, if it be strabismus divergens. A Bérard thinks that occasionally both eyes may be of equal strength, and that they alternate in their functions, and when so doing they assume a normal position. I very much doubt the correctness of such an opinion as far as regards their equable strength, but as to the manner of their *functioning*, I hold almost a similar opinion, and have promulgated it in a previous publication (prize essay, 1858) in the Transactions, concerning the alternate impressions in the production of vision in normal and healthy eyes.

Phillips and Hélicé have both noticed a very singular phenomenon

<sup>1</sup> Prize Essay on Vision and some of its Anomalies as revealed by the Ophthalmoscope, by M. A. P. Trans. Am. Med. Assoc. 1858, p. 895.

in double strabismus, which is, that one eye is myopic, and the other is presbyopic, which is rather convenient than otherwise to the afflicted individual, as he can use one eye for near objects, and the other for distant ones.

Bonnet<sup>1</sup> noticed another phenomenon attendant upon strabismus, which is, that a sense of fatigue is continually present, as one cannot read for any length of time, or observe small objects without experiencing the dragging heaviness so characteristic of visual fatigue. Maitre Jan attributed strabismus to a flattening of the globe, which more modern investigators have proven to exist, but certainly is not the cause of the lesion. He also stated that the deviated eye was smaller, which is correct in some instances, when the globe becomes atrophied from disease. Most frequently, however, it is only apparently smaller, no absolute diminution taking place, from the fact that it is drawn more deeply within the orbit.

*Diagnosis.*—The diagnosis of the deformity, whether it be single or double, and if single, in which eye, is no easy matter. Many methods have been devised which are worthy of a special notice, although, as yet, no one special plan has been advanced by which the deformity can, at the first glance, be recognized. Before attempting a description of the symptoms of each particular deviation, it is perhaps well to notice the scientific method by which Mr. J. D. Macdonald,<sup>2</sup> determines any variation in the co-ordination of the action of the visual muscular apparatus. This method is based upon the simple and pure mathematics of vision, viz: that the angle of reflection equals that of incidence, and that each ray is the radius of a circle having for its centre the focus of reflection.

Mackenzie, or rather the distinguished American editor of that celebrity's work on the eye, Dr. Addinell Hewson, of Philadelphia, speaks very highly of Macdonald's method; Haynes Walton makes distinguished mention of it, and it is quoted in the late American edition of Lawrence.

Desmarres, Graefe and Sichel, in the lectures at their *cliniques*, never fail to do justice to it, when on the subject of diagnosis of strabismus. The following, from the *Medical Times* of September, 1849, under the title of "Remarks on an optical experiment adapted

<sup>1</sup> Bonnet, *Traité des Sections Tendineuses et Musculaires dans le Strabisme la Myopie*, etc. Paris, 1842, 8vo. 8 fig.

<sup>2</sup> *Medical Times*, Sept. 1849. Remarks, etc., *vide* Walton, p. 254.



as a means of ascertaining the relative powers of the eyes, and indicating the first onset of morbid changes interfering with vision," by J. D. Macdonald. "It is a fact but little observed, that when a stratum of dust is laid upon the surface of a mirror, each particle and its reflection so lie, one with respect to the other, that a line drawn through them both will be, in every case, as the radius of a circle, whose centre is in the pupil of one of the observer's eyes as seen in the glass; so that an appearance of rays is thus produced, seeming to emanate from that point. The matter in itself is trivial, but, from what follows, it will be found to afford a delicate test for discovering the relative strength or visual capacity of one eye compared with the other, hitherto a desideratum in ophthalmic surgery. If the right eye be illuminated by a candle, while the left remains in shadow, the experimenter will perceive, by looking into a mirror, prepared as above, that the irradiation proceeds from the pupil of the shaded eye; and this without reference to its position.

"Placing the light on the opposite side (the left), the physical circumstances are altered, and the appearance is just the reverse of the former case.

"But should two candles be employed, one on either side of the observer's head, the lines formed by the dust particles, and their reflections, will either seem to irradiate from both eyes, as centres, or to spread from each side mutually across the opposite eye. In explanation of these facts, the writer finds that when any circumstance incapacitates either eye from discharging its functions perfectly (as the light in the first and second experiments cited), the unaffected organ appears to have dominion, and this is manifested by the radiation of the particles seeming to take place from its pupil in the mirror, and overpowering those of the other eye. In consequence of the sympathy existing between the optic nerve and iris, when a strong light falls upon the latter, the pupil diminishes in size, so as to regulate the amount of light impinging on the nerve, according to its sensibility. When one eye is thus influenced, its powers are lessened considerably, for while it is directed to the image in the glass, the iris cannot admit a sufficient amount of light to impinge upon the retina from that quarter, having a much stronger stimulus in active operation to contend with from another. This state of things is quite reversed in a shaded eye, because the iris is free from the action of a powerful light, and has only to discharge its office in allowing the ingress of as many rays from the dust particles, or their reflections, as the delicacy of the optic nerve can

bear, which fully accounts for the strength of the impression overpowering that of the weakened eye.

“When two candles are employed, as in the third experiment, both eyes are equally influenced, receiving a similar distribution of light, and are consequently alike fitted (*cæteris paribus*) for the performance of their respective functions, so that the lines necessarily appear to irradiate from both eyes. Now, the practical application of the experiments alluded to (if properly conducted) is this, that the least inequality of the powers of one eye when contrasted with those of the other, is instantly discovered, and the earliest onset of cataract, amaurosis, &c., is at once detected; for, if both eyes are similarly situated before a light which falls equally on each, the patient will himself discover where the defect lies, independent of any other proof, agreeably to the explanations above given. A very close relationship exists between the co-ordination of the muscular movements of the eyeballs, and the function of adaptation to distance, and also an intimate connection between this latter and the condition of the retina. Thus, if the retina of one eye be in any state of debility, the adaptive changes do not take place equally in both eyes, and, as a necessary result, the co-ordination of the muscular actions which so wonderfully effects the consensual movements of the eyeballs is disarranged, and strabismus (or squinting) is, under such circumstances, satisfactorily accounted for. If, then, in consequence of debility of one of the retinæ, whether from disease (as is usually the case), or from whatever cause, there is a tendency to squint, the eye so disposed, may be instantly detected by the foregoing experiment, in which it also assumes its wonted position. This test has been successfully tried by the writer in the case of an individual who had been subject to an occasional strabismus, frequently resulting from long concentration of the eyes on one plane, as in reading. There was a loss of co-ordination both in the muscular movement of the globes, and the power of adaptation to distance, and, in short, a want of balance in the tone of both organs. On looking into the mirror, as before explained, with an evenly adjusted amount of light on each eye, he observed the rays emerging from the left eye to cross and obliterate those from the right, which indicated to his own feelings and convictions, that the latter was the organ affected.

“The advantage of such a test at the present to the ophthalmic surgeon, must be obvious, when we consider that the sound eye has been frequently operated on in cases of strabismus, in conse-

quence of incompetent diagnosis. Of course strabismus must have been suspected before the above procedure could be gone through with, and it is specially applicable to those minor degrees when the surgeon is in doubt as to the existence or absence of strabismus."

As to the varieties of strabismus above-mentioned, there are some general observations applicable to them all, which need not be specialized, as they will be quite apparent in each variety to be described.

In the diagnosis of strabismus it may well be recollected that there are two great causes, upon which it depends. These are:—

1. Optical strabismus, which is, that it is produced by some derangement of the globe proper, such as spots on the cornea, cicatrices, amaurosis, cataract, &c. &c.

2. Muscular strabismus, in which the globe is not at all affected, but the cause depends upon a derangement of the muscular apparatus, which may be temporary (spasmodic) or permanent.

Whether a strabismus is dependent upon either of the above causes, its diagnosis is a matter of some moment, as modifications of treatment necessarily ensue.

In *simple strabismus*, or that of one eye deviated in one particular direction, either *convergens*, *divergens*, *superior*, *inferior*, &c. &c., in order to recognize the deformity, it must first be examined at quite a short distance from the observer, to see that the squint be not optical; then to look at the eye at a distance of not less than four feet, so that the squint may not be double, which often takes place when one eye is very much deviated. Having thus manœuvred, and being directly in front of the patient, the examiner raises some object in one of his hands, puts it towards his (patient's) nose, and he is then directed to look fixedly at this object. While this is being done, it will be perceived that the squint eye acts strongly and rapidly, whereas the healthy eye operates in an easy and normal manner. This difference of action is so marked, that the deviated eye is at once detected.

In *double strabismus*, one eye squinting more than the other, the diagnosis is rather difficult, Baudens<sup>1</sup>, Guérin,<sup>2</sup> Bourgery,<sup>3</sup> and Walton,<sup>4</sup> state that when one eye is operated upon, the other rectifies itself, most generally in a very few months, if not sooner. If the want of parallelism of vision be but slight, the correlation of

<sup>1</sup> Baudens, loc. cit., p. 66.

<sup>2</sup> Guérin, loc. cit., 2d ed., 1843

<sup>3</sup> Bourgery, loc. cit., p. 9.

<sup>4</sup> Walton, loc. cit., p. 253.



vision is not interfered with, as the eyes act in such harmony, that an attentive observer may convince himself by the following delicate test: The patient is directed to look alternately at any two fingers of either of his hands, and the eyes move in such unison of action, that the observer can determine upon which finger the attention is turned, as the eyes are both directed upon it. The diagnosis of double strabismus without any apparent difference between the eyes, is extremely difficult, as it is based upon such symptoms as can determine which is deviated from disease, and which from sympathy. When this condition exists, the diseased eye is the more deviated, and its vision is imperfect, and, when such symptoms are well marked, it is not difficult to determine the nature of the lesion. Unfortunately, however, they are but rarely well defined, and other distinctive characteristics are requisite to determine it; and, in this state, most generally, first one eye, and then the other squints, vision being nearly equal in point of strength in both. What is the surgeon to do in such a case? What slight shades of difference will decide the scale as to which eye should be operated on? In such a case, a patient investigation, a lengthy study of all the symptoms, a comparison of the two eyes with regard to distance, appreciativeness of color, size, &c. &c., sensitiveness, and particularly its history, are all requisite to the diagnosis of the weaker eye, which of course is the more deviated. Having determined which eye is in such a condition, that one must be operated upon.

Bourguery pointed out the fact that the *pupil of the weaker and more deviated eye was considerably more dilated than its fellow*. Baudens, Guérin, Velpeau, Desmarres and others, think that this abnormal dilatation is not constant, but that it happens only as a coincidence, unless there be some amaurotic tendency.

The most positive proof to be attained with regard to the weaker eye, is to place a piece of paper or a card upon the median line of the face, thus dividing it into two lateral halves. The patient is then directed to read with each eye alternately, and, much to his astonishment, he discovers which is the weaker eye. Upon this eye, Baudens distinctly states, the operation of strabotomy should be performed. *Double strabismus*, each eye being equally sensitive, is happily of rare occurrence, and its diagnosis must be made upon the same principles as that in which there is an unequal condition of visual force. Having diagnosed this variety of strabismus, a double operation is requisite.

Strabismus existing, a question often arises in its diagnosis, whether it is dependent upon a hyper-contraction of one muscle, or a paralysis of its opponent. To avoid error in this condition, a very simple procedure is required, which consists in causing the patient to execute the lateral movements, if it be strabismus *convergens* or *divergens*, and the vertical motions if it be strabismus *superior* or *inferior*. Take as an example strabismus convergens of the right eye, depending upon a paralysis of the external rectus. Let the patient stand facing the surgeon, with his head motionless; he is told to look to the left, and the cornea of the left eye approaches the external angle of the lids; the eyes are then directed to be turned towards the right, and the result will be an apparent convergent strabismus of the left eye, and a fixed, almost straight appearance of the right. The external margin of the cornea cannot under any circumstances be made to go beyond the lateral normal point of fixed gaze.

Having diagnosed the character and degree of strabismus, there are certain indications and contraindications which must be carefully considered, before the surgeon should decide as to an operation, and how it should be performed.

Strabotomy should not be indiscriminately performed; thus, if squinting should supervene upon any disease, cerebral or otherwise, the operation should not be performed, as the affection is but transient. Should it depend upon a spot on the cornea, myotomy would but rectify the deformity, with the risk of the loss, or at least the diminution of the power of vision. In strabismus dependent upon paralysis, myotomy is generally futile, from the fact that after the healthy muscle is divided, the other being paralyzed, it is totally inoperative, and consequently does not rectify the deformity. If, however, the axis of the cornea can be brought within the central external third of the eye, if it be divergent strabismus, and without the internal third if it be convergent, strabotomy is warrantable.

Strabismus, the result of adhesions, is very remediable, and myotomy in such cases is of the most marked benefit.

The contraindications are generally such as are applicable to every operation, viz: that the parts be healthy, and that the patient be healthy; Bonnet even advises to abstain from operating during the catamenia in females; he mentions a serious result attributable to this physiological condition. Having determined upon an operation, at what age is it preferable? Most authors,

among them Lucas, Guérin, and Baudens, advise, in children, to wait until the age of eight or ten years. Bonnet, Velpeau, and Auguste Bérard, state strabotomy is not only for the rectification of the deformity, but that defective vision must be remedied; hence they would operate much younger, and fix from three to four years of age as a proper period for so doing.

When *strabismus duplex* exists, shall we operate on one or both eyes? The preponderance of authority is for the single operation, as Walton, Desmarres, Velpeau, Hélié, Cunier, Bérard, and many others, detail many cases in the support of such a view, and I have myself seen the benefits arising from such a procedure. This rule has one exception, in that condition before mentioned, when each eye is equally sensitive and equally deviated, double myotomy is the rule.

#### STRABOTOMY.

The operative procedures for the relief of strabismus number somewhere in the neighborhood of forty, the best ones of which will be described.

It may be mentioned at once that they all resolve themselves into, and are but modifications of the three great methods, viz: that of Stromeyer, that of Velpeau, and that of Guérin. Besides these operative procedures, numerous *orthophthalmic* methods have been devised, meeting with varied success, though generally unreliable, and should be considered as simply palliative. They consist in electricity, galvanism, electropuncture; Boyer and Fabré-Palaprat detail successful results with the latter. Prismatic glasses have been highly vaunted, particularly by Kurke and Graefe, as well as opaque ones with such perforations as would induce a rectification of vision by bringing the pupil *vi et armis* in the axis of vision. Desmarres recommends them particularly in cases dependent upon spots on the cornea, &c. &c. Rognetta advised *lateral* reading, which consists in covering the sound eye with a bandage, and causing the patient to lie on his side, so as to force the pupil in an opposite direction from the deviation, and read every day for several hours. He recounts several cures by this method. The latest plan, advanced as an ophthalmic gymnastic exercise, is that of Dubois-Raymond, which is to make the patient read through stereoscopic glasses, or constantly look into that instrument in the examination of objects.



*Instruments.*—To recur again to the operative procedure, our attention is attracted to the instruments and apparatus devised, and simply for the history, if nothing else, an enumeration of the *earlier array* during the first two years after Stromeier's promulgation of his views, shows the eagerness with which the profession sought to place the operation among the classic ones of surgery. An attempt to give even the names of those of later dates would be absolutely futile.

Phillips had sixty-five instruments in his tenotomy case, and, according to Descarpes, other surgeons had even more. Up to March 12th, 1841, a period of not quite two years, the following instruments had been specially devised for strabismus, viz: three elevators, of Comparat, Casse and Pellier; five depressors, of Diefenbach, Lucas, Phillips, Guérin, and Charrière; eight dilators, of Langenbeck, Sichel, Rigal, Charrière, Furnari, Kelley, Velpeau (blephareirgon); two blepharostats, of Bouvier and of Charrière; six varieties of hooks, with one, two, or three prongs, of Adams, Sédillot, Carron du Villards, Charrière, Guérin, and Phillips; fourteen bistouries or myotomes of Adams, Doubowitski, Guérin, Lucas, Velpeau, Sédillot, Carron du Villards, Gairal, Charrière, Roux and Phillips.

Besides the above formidable array, there were more than ten varieties of scissors, curved or straight, and of sundry and divers shapes and sizes. For more than ten years afterwards, each surgeon devised some new modification, until the array of instruments was absolutely frightful; and, among such a number, one was at a loss how and what to choose. The last decennium has witnessed a most marked improvement in the simplification of the number and make of all the requisite instruments, so that, at the present date, not more than half a dozen instruments, if even that many, are ever used by the skilful surgeon. A blunt-pointed scissors, a spring speculum, a blunt hook, a bistoury, and a pair of forceps, are all the instruments necessary.

*Position of the Patient.*—The position of the patient during the operation is a matter of some importance. If chloroform be not used, he (or she) should be seated on a chair somewhat lower than the surgeon, the head resting upon the chest of an aid standing behind. The aid should with one hand hold the elevator, if one be used, and with the other keep the healthy eye closed. When the spring-speculum is used, this aid should hold the rat's-toothed forceps, in order to steady the eye to be operated on. A second aid holds

the *depressor palpebrarum*, if it is used; if not, he may be employed either in handing the instruments or in sponging the blood. When a child is operated on, more assistants are required to hold its hands, feet, etc., or, better still, to keep in its place the sheet in which the little sufferer is wrapped. The philosophy and rationale of the operation will be discussed further on, at the close of the paper.

I propose to give a brief account of each procedure, in its chronological order, beginning with that of Dieffenbach; as Stromeyer's has been before described.

Dieffenbach used a great many instruments, the detail of which is here unnecessary. After having seated his patient in a proper manner, and arranged the position of his aids, he proceeded as follows, supposing the operation to be performed on the right eye: The left eye is covered (as is the healthy eye in all of the procedures), and a small rat's-toothed forceps is implanted in the conjunctiva, near the lachrymal caruncle, being held by an aid standing behind the patient, by which the eye is dragged outwards; then a second hook is implanted near the cornea, not more than one and a half line from it, which the surgeon himself holds. The conjunctiva being thus thrown into a sort of fold by the two hooks, a vertical section is made in it by means of small clips of the scissors, until the muscle is exposed to view, the eye being dragged a little more outwards during that period by means of the second *crochet*. The blunt hook is then gently inserted from above downwards, under the tendon of the muscle, when it is divided by means of the scissors. The after-dressing consists in compresses, wrung out in cold water. Dieffenbach first promulgated the rule that, after an operation, the patient should rotate, as much as possible, both eyes, in order to see that the section had been complete, and that no adhesions existed. Upon the operation of Dieffenbach, all other modifications have been based, with the exception of Guérin's sub-conjunctival method.

The procedure of Phillips<sup>1</sup> differs but little from Dieffenbach's. Phillips, having arranged the patient and aids as did Dieffenbach, stood in front of his patient, and implanted two small hooks in the conjunctiva, in the spots indicated by Stromeyer, and then a vertical section is made as above described. The blunt hook is then introduced, and the tendon pulled off from the globe with the point

<sup>1</sup> In the description of these operations, it is presumed that convergent strabismus of the right eye is the lesion in question.

of the scissors; a further dissection is made of the muscle from its surroundings, and when it is clear the section is made.

The procedure of Lucas, of Duffin, and of Lietch, consists in seizing the conjunctiva near the lachrymal caruncle, with a forceps having small square plates instead of points. A double hook (tenaculum) is implanted near the cornea to draw the eye outwards. An incision is then made with a cataract knife (Dufresne), or with a bistoury (Phillips), or with the scissors (Dieffenbach), through the conjunctiva, so as to expose the muscle, when a probe is passed behind its tendon, and upon it the muscle is divided with a bistoury.

The procedure of Ferrall differs but slightly from the others. The lid is held up by an aid by means of a speculum, the lower lid being depressed by means of the finger. The eye is not drawn out by means of any instrument, the lachrymal caruncle being only pushed in with a small double hook. The conjunctiva is then seized and raised three lines from the cornea, and divided at one cut of the angular scissors. The lids are then closed, and the patient is permitted to rest some moments, when they are again opened, and the blunt hook is introduced in the wound and the tendon drawn out, when one of the blades of the scissors is introduced, and the muscle is divided at its attachment to the sclerotic.

The procedure of Sedillot differs from the others principally from the fact that he operated upon his patients whilst they were in the recumbent position. Having arranged his aids, placed between the lids a spring speculum, he fixed a very small three-pronged hook near the cornea, and dragged the eye outwards. Having given this to an aid, he caught up a fold of conjunctiva by means of an ordinary forceps, and divided it at one stroke. This exposed the muscle, under which was passed a canulated spatula upon which the tendon was divided by the scissors.

The procedure of Liston, like all of that great surgeon's operations, was of the simplest character; remarkably so, from the fact that all of the continental tenotomists used such an abundance of instruments in all cases. The patient was seated as in most procedures, the head resting upon the breast of an aid, who held up the lid with an elevator of Pellier. The lower lid was then depressed, and a flat-toothed spring forceps attached to the oculo-palpebral fold, and which was left to hang upon the cheek; this held the eye almost immovable and the lower lid depressed. The muscle was then divided with the scissors, after the conjunctival



wound was made, and it (the muscle) had been drawn out by means of the blunt hook.

The procedure of L. Boyer is rather more complicated than any of the preceding ones. The arrangement of the patient and aids is similar to the preceding ones, as also the position of the eye and the use of the elevator and depressor. The first step of the operation consists in the seizure of the conjunctiva with a forceps, midway between the lachrymal caruncle and the cornea; then to apply a second forceps so as to plicate the membrane. These forceps are then intrusted to an intelligent aid (upon whose skill depends, in a measure, the result of the operation), when a vertical incision is made which exposes the tendon. The second step of the operation consists in the aid withdrawing his forceps from the internal flap of the conjunctiva, and seizing the muscle at its sclerotical attachment, thus holding the globe more firmly, which permits the surgeon to withdraw the second forceps. The subconjunctival cellular tissue (as in all procedures) is then divided either above or below, so as to allow the passage of the blunt hook. This having been done, and the tendon properly isolated, the third step of the operation consists in the division of the muscle either by a scissors or a bistoury. It sometimes happens, in all operations for strabismus, that the muscle is incompletely divided, being made manifest when the action of the opposing muscle does not rectify the deformity. In such a condition, the blunt hook must once more be introduced and proper search be made for whatever is left undivided.

Boyer used the double hook in all of his operations, which was introduced closed, but which could be opened by a spring, and in its interspace the scissors could well act.

The procedure of Baudens was for many years the favorite one of all surgeons, and is now that of some of the French surgeons, and, in the hands of its author, was one of the most rapid and elegant operations of ophthalmic surgery. The position of the patient, the arrangement of the aids and instruments, is the same as in Dieffenbach's procedure. All having been arranged, a small stout *érigne* is implanted at the inner angle of the oculo-palpebral reflexion of the conjunctiva, a little above the transverse axis of the globe. By thus acting, the insertion of the muscles is seized, and the eye may be dragged outwards until it assumes a normal appearance, the deviated muscle appearing like a stretched cord. A curved bistoury (upon its axis), the cutting edge upon the concavity, the point small and the heel broad, is then inserted

under this cordiform fold, and is made to cut its own way out through the muscle, tendon, fascia, etc. etc. All fibres of connection are not usually divided in one passage of the knife, and the flat of the curved bistoury, or a small spatula is passed under the tendon, and the section is completed by means of the scissors.

The procedure of Sichel is excessively difficult, although the author uses but three instruments, the blunt hook much flattened, an *érigne* (tenaculum hook) of Richter, and a scissors considerably curved on the flat.

The patient is seated upon a chair or stool lower than the surgeon's, his head supported by something firm, and the eye is turned upwards and outwards. The upper lid remains *in statu quo*, whilst the lower one is depressed by the patient himself. If it be a child or some irresolute person, the assistance of an aid is requisite. The conjunctiva is seized by the tenaculum a little below and about two lines outside of the lachrymal caruncle, and is vertically incised with the scissors. The parts are well sponged with cold water, and a little respite is here given to the patient. When the hemorrhage has ceased, the surgeon raises the upper lid with the thumb of his left hand, and with his right, gently insinuates the blunt hook from above downwards, under the tendon of the muscle. The curved scissors are then introduced, with the convexity towards the nose, when the muscle is properly divided.

To perform the operation according to such a procedure is more than difficult, and but few have ever succeeded by it. The later operations, however, of Mr. Lucas have been performed without the use of an elevator, he himself managing the lids during the process. Walton also states: "I have, on several occasions, with resolute patients, for the purpose of showing pupils the simplicity to which the whole proceeding may be reduced, laid aside all instruments but a pair of scissors and a blunt hook, an assistant raising the lids with his fingers."

The procedure of Amussat is a union of Guérin's subconjunctival method, and that described as that of Stromeyer; its execution is difficult; it requires special instruments, and offers no advantages over some others, although its advocates, to the exclusion of all others, have been many and able. The great object of this modification is to prevent a dropping of the lachrymal caruncle, and to do this, he did not touch the semilunar fold and that portion of the conjunctiva embracing the caruncle, but left a bridle of tissue which held it in its place.

The patient being seated in a high-backed chair, his head resting upon it, an aid separates the lid with his fingers, when the surgeon seizes the conjunctiva about a line in one place, and three and a half lines in another, a little above the equator of the eye; this throws the membrane into a fold, in the centre of which a small vertical incision is made; into this opening the blunt pointed scissors is introduced, and an incision is made horizontally towards the internal angle. The sclerotic is now exposed, covered by the layer of loose cellular tissue, which must be separated from around the tendon by means of one shank of the forceps; the spring blunt hook is then introduced from above downwards, and gently inserted between the sclerotic and the tendon, when the latter is divided between its branches at a single stroke of the scissors. Amussat himself pointed out the great drawback to this operation, which is in the production of a subconjunctival thrombus, which is of long duration, if a counter-puncture be not immediately made to permit the escape of the blood. Very frequently this operation fails from the non-division of the tendon, which is always more or less difficult when not perfectly exposed.

The procedures of Velpeau are two, the first of which he seldom, if ever, employs at present. The second is that which he usually uses, in fact for the last ten years it has been his almost exclusive plan.

I. The patient is seated as usual, and the aids' duties are apportioned as in Dieffenbach's method. The upper lid is elevated by Pellier's elevator, and the lower depressed by a blunt hook; they are not placed upon the conjunctiva as in other cases, but are fixed upon the cutaneous surfaces near the ciliary margins. The patient is then directed to look as much as possible to the outside, when a small double *érigne* is implanted in the conjunctiva and sclerotic near the lachrymal caruncle, by which the eye is dragged outwards, when it (the instrument) is handed to an aid. The surgeon then takes a single-branched *érigne* in his left hand, and gently insinuates it under the muscle from above downwards, which rolls the conjunctiva and fascia into a cordiform shape (care being taken not to traverse anything save the conjunctiva), after which it is drawn forwards, and a narrow bistoury, concave on its cutting edge, is passed behind the *érigne*, which is then gently withdrawn. The edge of the bistoury is next turned to the muscle, and at a single stroke, tendon, fascia, and conjunctiva are divided.

II. The lids are separated and so maintained by means of the



*blephareirgon* (a spring speculum), which renders the presence of more than one aid useless. The surgeon then seizes quite a large fold of conjunctiva with the forceps (*pincers à griffes*), in which is comprised the attachment of the muscle, then with another similar forceps the body of the muscle is seized farther back: this forceps is handed to an aid, the other is held in his left hand. A small blunt-pointed scissors is then taken in the right hand, and made to divide the conjunctiva and muscle at a single stroke, it is well, however, to slide one blade of the scissors behind the attachment of the tendon and a little posterior to it, in order to separate the connective cellular tissue from around it, and to divide such portions as are left uncut.

The procedure of Walton is very simple and effective, and is perhaps the most rapid of all in execution. The patient is seated or lying; an elevator is inserted under the upper lid, which is handed to an assistant standing behind, who also supports the patient's head. With a forceps in the left hand, the little or third finger depressing the lower lid, a fold of conjunctiva is seized opposite the lower edge of the internal rectus muscle, and a little posterior to its insertion into the sclerotica.<sup>1</sup> A small vertical opening is then made through the conjunctiva and subcellular tissue, sufficiently large to admit the hook, and afterwards one point of the scissors. The hook is then introduced, from below upwards, under the muscle which is made prominent, and with the scissors is divided at its tendinous expansion within the hook, together with the superimposed conjunctiva. The point of the hook is manœuvred and brought down as near as possible to the upper edge of the wound, in order that no more of the conjunctiva be cut than is absolutely necessary. Latterly, Mr. Walton has adopted Cunier's plan of putting fine sutures in the conjunctival wound, with a needle blunted at the edges so as not to cut its own way out, which prevents a falling down, if not frequently a loss of the lachrymal caruncle, which is a serious evil. These sutures often ulcerate out at the end of three days; which if they remain longer they should be removed. They do not irritate at all, soon becoming softened with mucus, so that the patient is not aware of their presence.

According to Mr. Bowman, the probable use of the lachrymal

<sup>1</sup> "A probe passed vertically under the internal rectus muscle of an adult, and pressed against its point of attachment to the sclerotica, will reach to nearly three-eighths of an inch of the cornea, and that is the spot where the cornea should be opened." Walton, *Op. Opth. Surg.*, p. 260. Am. ed. by S. Litte'l, M. D.

caruncle is to "throw the tears into a little pool above it, where they may be taken up by the puncta, for the lower punctum glides above the caruncle in the winking movements of the lids." Now one of the chief aims of strabotomy is the maintenance of the eye in a proper position, after it has been rectified, another is to prevent any sinister result, and to leave as little mark of what has been done as possible. Very frequently some of the tendinous fibres are not divided, and to discover which Mr. Walton states, "diligent search may be needed. Then the sub-conjunctival tissue, when thickened, forms a complication troublesome to overcome. It is liable to be taken up instead of the muscle."<sup>1</sup> In such a case much cutting must of necessity ensue, and the wound when left to itself necessarily gapes, and in healing, large granulations are apt to follow, and *ex necessitate rei*, considerable, if not total, displacement of the lachrymal caruncle is the consequence. Such contingencies are removed by the use of sutures, "for with them there is a rapidity of repair, formerly thought impossible in the case of mucous membranes. Nearly always there is union by the first intention, and sometimes by adhesion. Fungous growths so common without them never appear. By the use of sutures, are secured a certainty of execution, and the greatest safeguard we can employ against eversion and prominence of the eyeball, and the preservation, as far as it is possible, of the natural outline of the eye."<sup>2</sup>

The procedure of Guérin, or the sub-conjunctival method. This plan is peculiar and ingenious; special instruments are necessary, which are three double hooks (*érignes*), a conjunctival perforation (lance-shaped), double edged and slightly curved on the flab; a Z shaped myotome, concave on the back, convex on the edge, and elbowed with its handle (bayonet shaped). At present most operators chloroform their patients, when of course they are completely under the surgeon's control. Frequently, however, anaesthetics are not used, when the patient should be fixed as follows: His head slightly thrown back, resting upon a large pillow; two assistants are necessary, one at the head of the bed, to control the upper lid, and the other on the side of the eye to be operated on. The depressor and elevator (*refouleurs*), are applied to the surfaces of the lids, as in one of Velpeau's procedures. Guérin particularly recommended that the *refouleurs* be placed near the lachrymal

<sup>1</sup> London Lancet, p. 246, March, 1858.

<sup>2</sup> Ibid.

puncta, thereby preventing the palpebral fissure being brought in front and masking parts to be operated on. All being thus arranged, an *érigne* is implanted in the conjunctiva near the cornea, in order to draw the eye outwards; then a second *érigne* is put into the conjunctiva and sclerotic, about three lines from the cornea, near the insertion of the tendon. The first *érigne* is then withdrawn, and sufficient force exerted on the second to drag the eye outwards, to put the muscle between its two attachments upon the stretch, thereby detaching it from the globe proper, enough to permit the passage of the myotome between them. An assistant then raises the conjunctiva with its fibrous sheath on a level with the lateral portion of the sheath of the muscle, by implanting a third hook, two and a half lines inside of the second hook, not on the same plane, however, two and a half lines below, in the right eye, and the same above on the left eye. The operator then opens the conjunctiva at the base of the fold with the perforator, with its convexity towards the globe, directing it as a "tangent in a line intermediate between the horizontal and vertical," thus traversing the two facial layers, made cognizant by the resistance offered. This being done, a lateral deviation is described with the point of the instrument, which opens the septum of the muscular sheath, thereby enlarging the space in which the myotome will act. The elbowed myotome is then introduced with its concavity towards the globe, and in this position of the instrument, the first elbow corresponds with the globe of the eye, and the second to the orbital border. The blade having penetrated vertically for three-fourths of its length, it is deviated a little outside of the muscle, when it is glided under it, two lines from the external wound, by depressing the handle of the instrument, and raising the end of the blade in the direction of the globe. Being certain of the position of the instrument, and that it is under the tendon, the handle of the instrument is turned upon its axis, presenting the convex edge of the muscle, which is divided by slight sawing motions. The division is made known by an audible crack, and a sensation of the cessation of resistance. At the moment of division, Guérin states that it is most important to draw upon the hook, so as to keep the muscle in a state of tension. If the patient is unable to adduct the eye after the myotomy, the second introduction of the instrument, and a second manipulation is absolutely requisite.

The procedure of Critchett is a combination of the ordinary one with the subconjunctival of Guérin. Mr. Critchett states that he



has invariably found after the usual operation, even when it has handsomely succeeded, when the eye has assumed its normal position and regained its regular motions, that there is a "certain sinking in and loss of the caruncle, so that the inner part of the globe seems more exposed than the opposite eye, and a fossa exists in the place of the caruncle; this, so far as my experience goes, is an invariable result of the operation, and explains the circumstance that has been often remarked, that those cases are the most successful in which it has been necessary to operate on both eyes, the double defect being less conspicuous than when one only has been divided, and is brought into competition with the natural state of the parts."<sup>1</sup> To avoid such an unfortunate result, and also any protopsis (unusual prominence of the globe) or eversion, which sometimes produces a hideous deformity, rendering matters by far worse than previous to the operation, together with some minor objections—such as granulations springing from the wound, frequently growing to such a size as to induce suppuration, etc.—Mr. Critchett devised the following operation, the essential condition of which is the subconjunctival division of the muscle. The patient, if very young, or nervous and restless,<sup>2</sup> is put under the effects of chloroform, when the spring-speculum is introduced under the lids to keep them separated; the globe is everted by an assistant, who uses the ordinary forceps, when the surgeon seizes the conjunctiva (the assistant then releases his hold) at a point opposite the lower margin of the internal rectus, when he makes a small horizontal incision with a pair of stout blunt-pointed scissors. The subconjunctival fascia is then treated in the same manner, whereby the sclerotic is neatly and well exposed. The blunt hook, not with the ordinary curve but bent at a little less than a right angle, is "swept around" the globe, so as to completely pass between the sclerotic and the tendon; the sensation of a resisting obstacle indicates to the surgeon the success of the manoeuvre. Both blades of the scissors are then passed in the wound, when the muscle is divided by a series of small cuts close to the sclerotic and between its insertion and the blunt hook. When the tendon is broader than usual, and its upper border cannot be well reached, a small counter-opening is made in the conjunctiva immediately over its upper margin, when the hook

<sup>1</sup> London Lancet, July, 1855, p. 29.

<sup>2</sup> I think it decidedly better, in an operation of such nicety, always to chloroform the patient.—M. A. P.

is introduced from above, where the portion of the tendon which is undivided may then be cut. The counter-opening also facilitates the escape of such blood as may have been infiltrated during the operation. In many cases following the ordinary operation, eversion ensues—either immediately, or weeks, or perhaps months afterwards—in consequence of the union either being incomplete or its becoming stretched, as in fractures of the patella, which frequently disunite and gape for a considerable extent. In such cases, Mr. Critchett has proposed and executed with marked success the following operation: The eye is exposed as in the operation for strabismus, when all the tissues covering the inner part of the ball, including conjunctiva, subconjunctival fascia, muscle, and the condensed cicatricial tissue around it, are neatly dissected away from the sclerotics. The dissection should begin at about two lines from the inner margin of the cornea, first going upwards, downwards, and inwards, and should be done very carefully, as the flap ought to be raised entire. Critchett advises the scissors in such a dissection. When this is complete, the external rectus should be divided, as in the method above described for the internal rectus. The next step consists in passing the sutures at the dissection. To do this, extreme delicacy is required, as the difficulty is great, owing to the great tenuity of the membrane. Very small semicircular needles, armed with the finest of silk thread of any strength whatsoever, are required. The flap is drawn forward and held tense by means of the forceps, and the first suture passed at the lower internal border rather near the cornea, and the other sutures are thus passed horizontally at intervals of about two or three lines apart. When to that portion of the conjunctiva which has been left attached near the cornea, it is requisite to attach the flap, the greatest difficulty is encountered, as the threads are apt to be torn out. Mr. Critchett<sup>1</sup> describes his procedure at this stage as follows: "I first separate this portion upwards towards the cornea; the needle must then be passed through it, and then back again, so as to include a portion, which must be tied tightly so as to prevent it from tearing out. The next point is to cut away all that portion of the lower flap that can be spared beyond the part where the suture has entered, merely leaving a margin to hold it. The silk may now be drawn tightly, and tied to the end that is already fixed near the cornea. The immediate effect of this proceeding ought to be to procure some inversion, if

<sup>1</sup> London Lancet, loc. cit., July, 1855, p. 32 et seq.

the various steps of the operation are properly performed. The hope and intention are to get the parts to unite to the globe in their new position, and thus retain the eye. This, however, is only partially the case; there is always some tendency partially to relapse, and in two cases I had to repeat the operation with ultimate success. The sutures may be allowed to remain until they ulcerate through; the subsequent inflammation is usually slight. The amount of mobility in the eye is very limited, but so long as it occupies the central position, this circumstance is not found practically to occasion much deformity, and is an immense improvement upon the facial discord resulting from extreme eversion."

Bowman and Desmarres have successfully performed this operation, and speak in the highest terms of it.

Mr. Holthouse's procedure is pretty much based upon the same grounds, as far as object to be attained, as is Mr. Critchett's, and is altogether subconjunctival. The patient is arranged in the same manner as in Critchett's operation; the eyelids are held apart by the spring speculum, the eye is drawn out from its position by the ordinary dissecting forceps, when a small incision is made in the conjunctiva and ocular fascia of Malgaigne to the sclerotic, at a point three lines and a half internal to the inner margin of the cornea, either above or below its equator, accordingly as the muscle is to be divided from above downwards or *vice versâ*. Into the incision made by the probe-pointed scissors, a *strabotome*<sup>1</sup> is introduced under the muscle, with its cutting edge turned towards it, the back towards the sclerotic. A slight sawing motion rapidly causes the division of the muscle, which generally yields with a "very audible crack." The instrument is to be withdrawn as it entered, when the operation is finished. The same advantages are claimed for this operation as are urged in favor of Mr. Critchett's.

Frequently there results from an operation for strabismus, or exists idiopathically, *lucitas* or fixedness of vision. In such cases Mr. Wilde, of Dublin, has practised the method of Cunier, or rather somewhat modified his procedure. Mr. Wilde first called attention to this subject in the *Dublin Journal of Medical Sciences* for March, 1844. In this instance the patient was a female aged thirty (30) years, suffering from trichiasis and double convergent strabismus,

<sup>1</sup> Holthouse's strabotome consists in a small narrow-bladed knife, the blade of which is bent at an angle of 45° to the shank, very much resembling Guersant's tenotome.



who was successfully operated upon by the application of ligatures to the recti muscles. The right eye was first operated upon, and after a division of the muscle and a clean dissection of the surrounding parts, it was observed that the condition of *lucitas* continued, and that every fibre of the muscle had been divided. Such being the case, the sclerotic extremity of the muscle was seized by a forceps, and a curved needle armed with a ligature passed through it in two places. Having thus done, and a purchase being secured upon the globe, he drew it outwards, until the cornea was rather more to the outer angle than otherwise, when the ligature was secured over the malar bone, by means of adhesive plaster. This took place on the fourth of the month, and on the seventh the ligature had cut its way through the tendon, and the globe maintained its position. The second eye was also similarly operated upon, on the ninth day following, and on the second evening thereafter the ligature was withdrawn, and this eye was also in its normal position. For a short period of time there was *diplopia* which passed off, and nine months afterwards she continued in a very favorable condition of healthy vision. Among the curiosities of the various operations on the eye, is Guérin's procedure for the rectification of eversion following strabotomy. Mr. Walton seems to doubt the efficacy of the operation, and merely quotes Desmarres, who "thought well" of it.<sup>1</sup> It was my good fortune to witness Desmarres operate in this manner, in June, 1857. The patient was a young man of about twenty (20) years of age, and had been operated upon by several Dutch surgeons of eminence, both in Amsterdam and Rotterdam, first for the relief of convergent, and twice afterwards for divergent strabismus. Previous to the operation Desmarres presented him to the class for inspection, when there was discovered a most extensive divergent strabismus, two-thirds of the cornea being buried in the outer angle of the eye.

The patient was placed upon the table, when Desmarres rapidly explained the steps of the operation, which was performed as follows: A flap, similar to that formed by Mr. Critchett's procedure, was first made upon the outer margin of the globe, and after considerable dissection of the cellular and cicatricial tissues (the globe all the time being drawn inwards by means of a forceps in the hands of an assistant), the tendon of the external rectus was found and divided. The tendon of the internal rectus was likewise sought

<sup>1</sup> Walton, *loc. cit.*, pp. 268-9.

for, discovered, and divided, but it was attached very far back. After its division it was drawn forward so that it might become attached much more anteriorly, as near as possible to its normal insertion. These steps of the operation being completed, a needle armed with a silk thread was passed through the fascia, about one line within the cornea, and the eye drawn slightly inside the axis of vision, when the thread was attached to the opposite ear. Two days afterwards the thread was removed, and in ten days more the wounds were completely healed, and the patient possessed the normal motions of the globe.

With regard to the section of the superior and inferior recti muscles, the same rules and procedures are equally applicable. As for the division of the oblique muscles, there is so much uncertainty concerning their physiological action, that from the combined testimony and experience of most ophthalmologists it is highly inexpedient so to do.

As numerous and ingenious as are the various operations for strabismus (many of which have been crowded out of this paper for the want of space), it is surprising to see the number of successful attempts, and for this reason makes it the more difficult to determine as to the superiority of any one method. In order to decide as to the merits of the best operation, it is well to once more understand that strabismus is an alteration of the mean length of the opposing muscles, whatever may be the cause of that alteration, whether it be a change in the structure of the muscle itself, or a real insertion of its tendon. After an operation for strabismus, generally, if not always, the attachment from cicatrization takes place posterior to the normal insertion; hence to obtain a correction of the position (strabismus) and in proportion to the amount of deviation, the tendon must be divided farther back in such a ratio as will so induce the rectification.

Thus, when the strabismus is but slight, the tendon should be divided as near the sclerotic as possible, and the wound in the conjunctiva should be but small, which must be united by a suture; and in proportion to the deviation, so will be the division from the sclerotic.

The above remarks being premised, and without an explanation which would not be out of place, I take the liberty of suggesting that the procedure of Mr. Critchett, *with the addition of a suture in*

*the conjunctival wound*, is decidedly the best for such cases as present a less deviation than two lines from the central axis of vision; and that of Walton superior to any of the others for such cases as present a greater deviation than two lines.

NOTE.—Want of space prevents the introduction of the second part of this report, as it would occupy too many pages, and present the formidable dimensions of a book, rather than the modest pretensions of a report, hence, I propose on some future occasion to finish the subject by offering a special paper on Glaucoma, Artificial Pupil, and Cataract.







